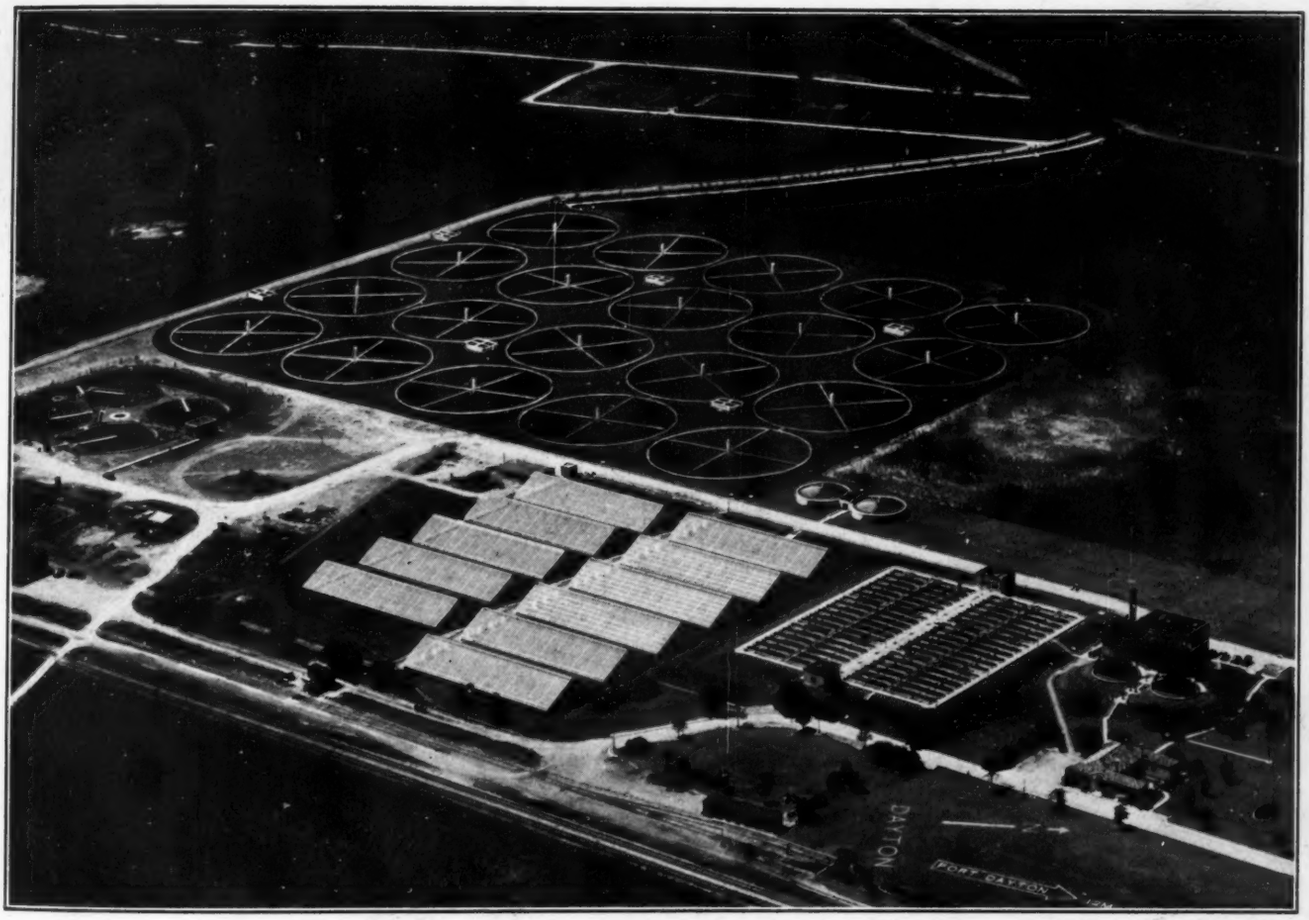
WATER WORKS & SEWERAGE

A GILLETTE ABC PUBLICATION

Vol. 86, No. 2 FEBRUARY, 1939 L. H. Enslow Editor



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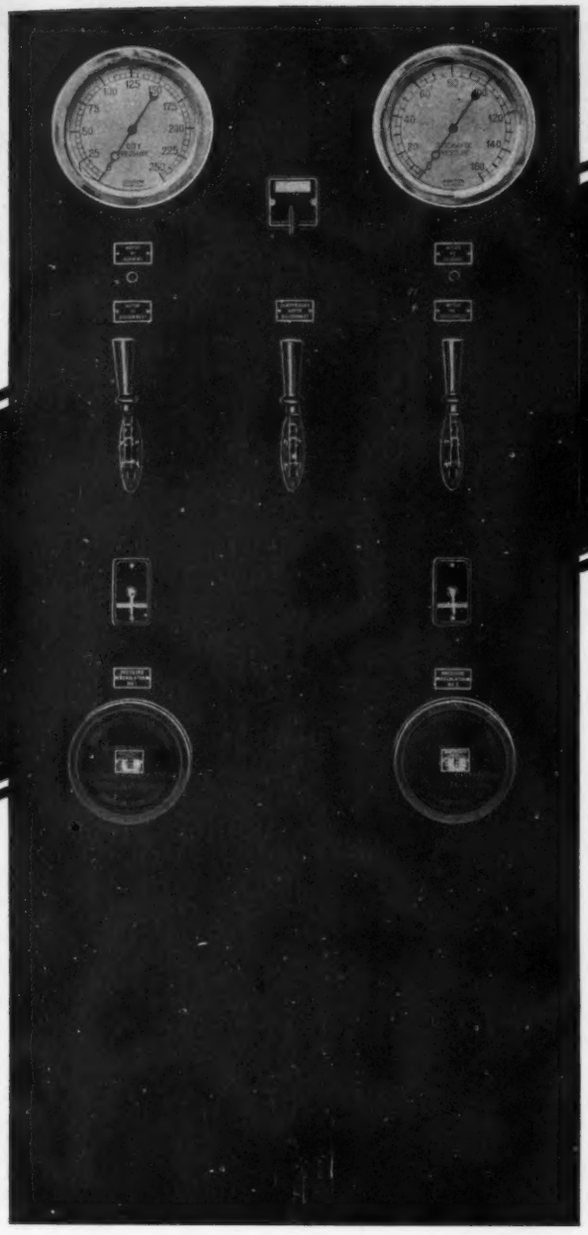

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"3C" Dead Front Duplex Pump Controller

Providing Completely Automatic Pressure Controlled Operation of 1-15 H. P., 230 V., D. C. Motor and 1-15 H. P., 208 V., 3 Ph. Squirrel Cage Motor.

¶ In addition to the completely automatic pressure controlled operation, this "3C" panel provides the means for manually operating either starter.

¶ It also has equipment to interconnect either Pressure Regulator with either Starter, so that either motor may be made the leading unit.

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¶ Built of sturdy "3C" apparatus, this Dead Front panel offers not only safety to motors and operator, but also gives long life with minimum maintenance.

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1146 EAST 152ND ST. CLEVELAND, OHIO

WATER WORKS AND SEWERAGE, February, 1939. Volume 86. Number 2. Published monthly at 330 South Wells Street, Chicago, Ill., by the Gillette Publishing Company. Per copy, 25c. Subscription rate, United States and Canada, $2.00 per year; Foreign, $3.00 per year. Copyright, 1939. Entered as Second Class Matter, June 2, 1931, at the Post Office at Chicago, Ill., under Act of March 3, 1879.

Pennsylvania

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*Liquid Chlorine

*virtually free from organic impurities

*Perchloron

*A dependable source of chlorine in emergencies

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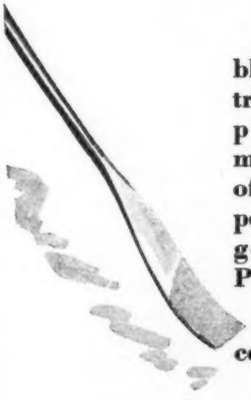

In case of storm, flood, blizzard, or other catastrophe, your normal supply of liquid chlorine may be temporarily shut off by a tie-up of transportation. In such emergencies, a supply of Perchloron means safety.

AND FOR EMERGENCIES

. . . a second line of defense

Perchloron, with an available chlorine content of over 70%, is concentrated, stable, and uniform. Dissolves readily in water. Packed 12 handy cans to the case, each can with punch-and-pry-up top. Comes also in 75 lb. drums. You will find it of value, not only for emergency chlorination, but for sterilizing new mains, for clear wells and filters, and for swimming pool sanitation. Why not write for free booklet?

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Almost 3.0 million gallons per day of this was eliminated by caulking the joints for a distance of 7,628 feet. This operation cost the city $7,476 and required two years for completion."

Thousands of dollars can be saved in the cost of maintenance and sewage treatment by using tightly-connected Armco Sewer Pipe wherever a high water table is encountered.

There are fewer sources of leakage in an Armco Sewer because its long lengths mean fewer joints per mile. This also helps reduce installation costs.

Water-tight joints are assured by sturdy bolted couplings that join each section into a tight line that will not break or separate. No cradling is needed.

● With State Boards of Health demanding effective treatment of all domestic sewage, it is becoming vitally important to eliminate every possible gallon of ground water leakage into sewers.

To solve this problem economically you need a sewer pipe with strong, water-tight joints; a pipe with enough strength and flexibility to overcome unequal settlement. Yet can you be sure of these results with short sectional types? Some say, yes. Some say, no. But in any event you can be *doubly* certain with Armco Sewer Pipe because its sturdy corrugated iron construction and tightly-coupled joints eliminate all danger of breakage and infiltration.

Besides, Armco Sewer Pipe ends the worry of material failure. Its galvanized iron base already boasts a 32-year service record in sewers. And remember, this pipe is paved in the bottom and fully coated with a special bituminous material inseparably bonded to the pipe. Write for 48-page Sewer Book. Armco Culvert Mfrs. Assn., Middletown, O.

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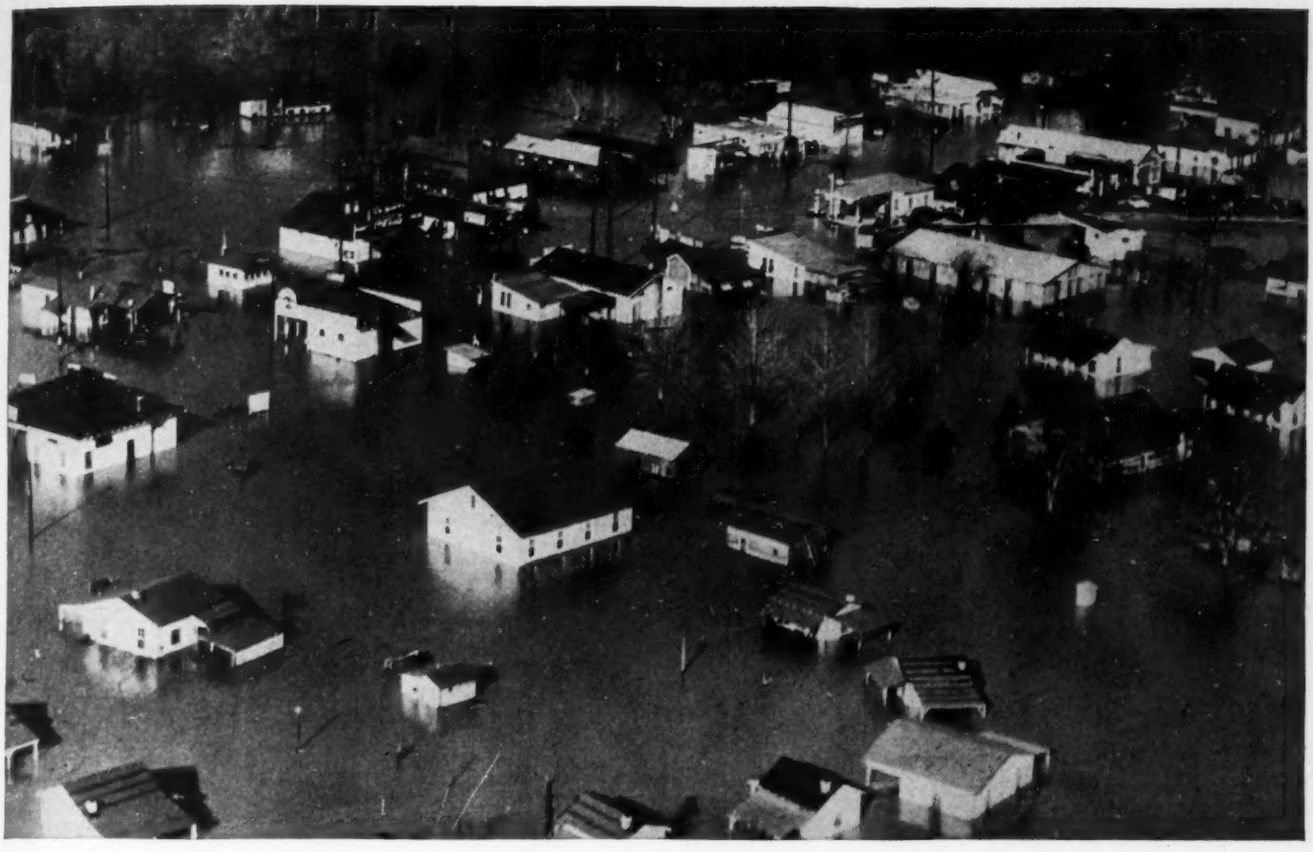

WHEN floods bring the threat of polluted water supplies and of water-borne disease, HTH proves itself an invaluable ally to water works and health officials. With HTH, emergency hypochlorination can be applied quickly, on the spot, wherever pollution is found. A highly concentrated chlorine carrier, containing 70% of available chlorine, quickly soluble in water, HTH can be transported to the job and put to work before a dangerous situation has time to develop.

Then there is the aftermath of flood conditions, as receding waters leave a seemingly hopeless task of cleaning up and disinfecting flooded areas and buildings of every kind. Here again health authorities find HTH of invaluable assistance in restoring sanitary conditions in scores of places where a less concentrated, less mobile or less soluble source of chlorine cannot serve as effectively.

Fortunately, floods do not strike frequently at the average community nor do they strike so quickly as to find local officials wholly unprepared. But there are day-to-day emergencies, too, which require prompt and effective chlorination—broken water mains, an abnormal water load due to a serious fire, polluted wells, failure of a chlorinator, an interruption in the power supply—just the sort of jobs for which HTH is made to order.

No wonder that so many experienced water works men keep an ample supply of HTH always on hand, not only as an important measure of preparedness for every sort of emergency, but also because they find it so useful in scores of every-day sanitation jobs! Write or wire us for full information and nearest available stock.

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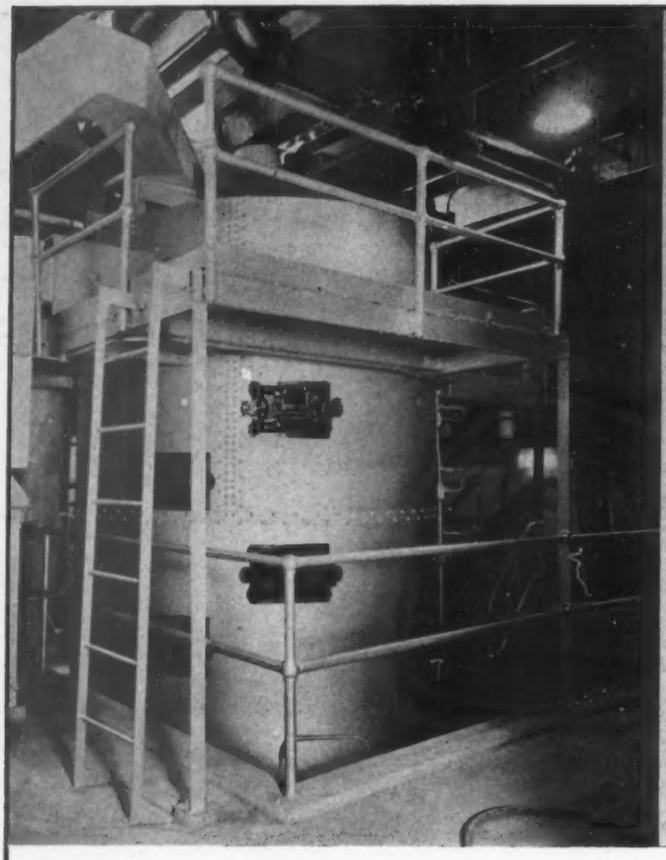

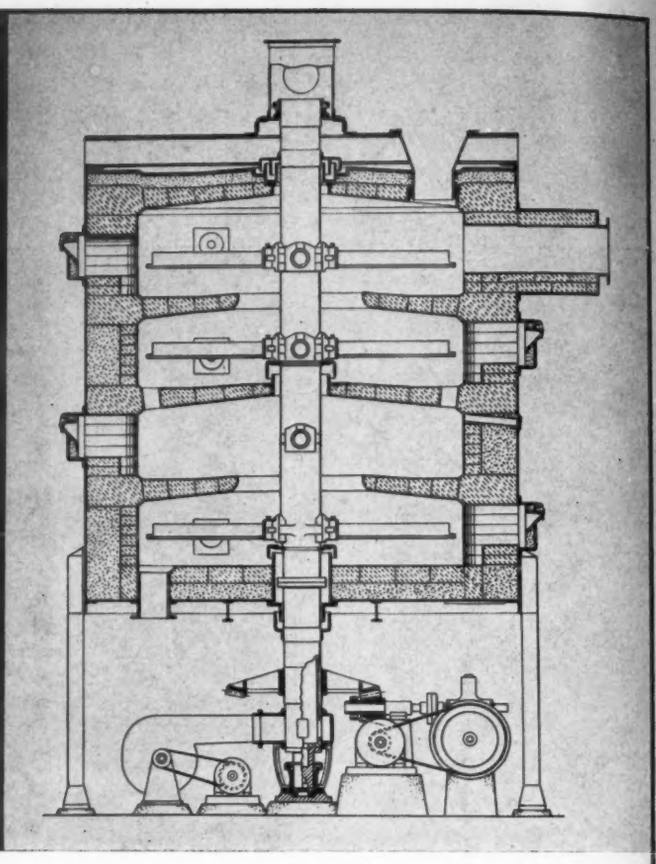

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Nichols Herreshoff Sewage Sludge Incinerators assure positive, sanitary sewage *disposal* for thirty-four communities with populations ranging from 7,000 to 2,500,000.

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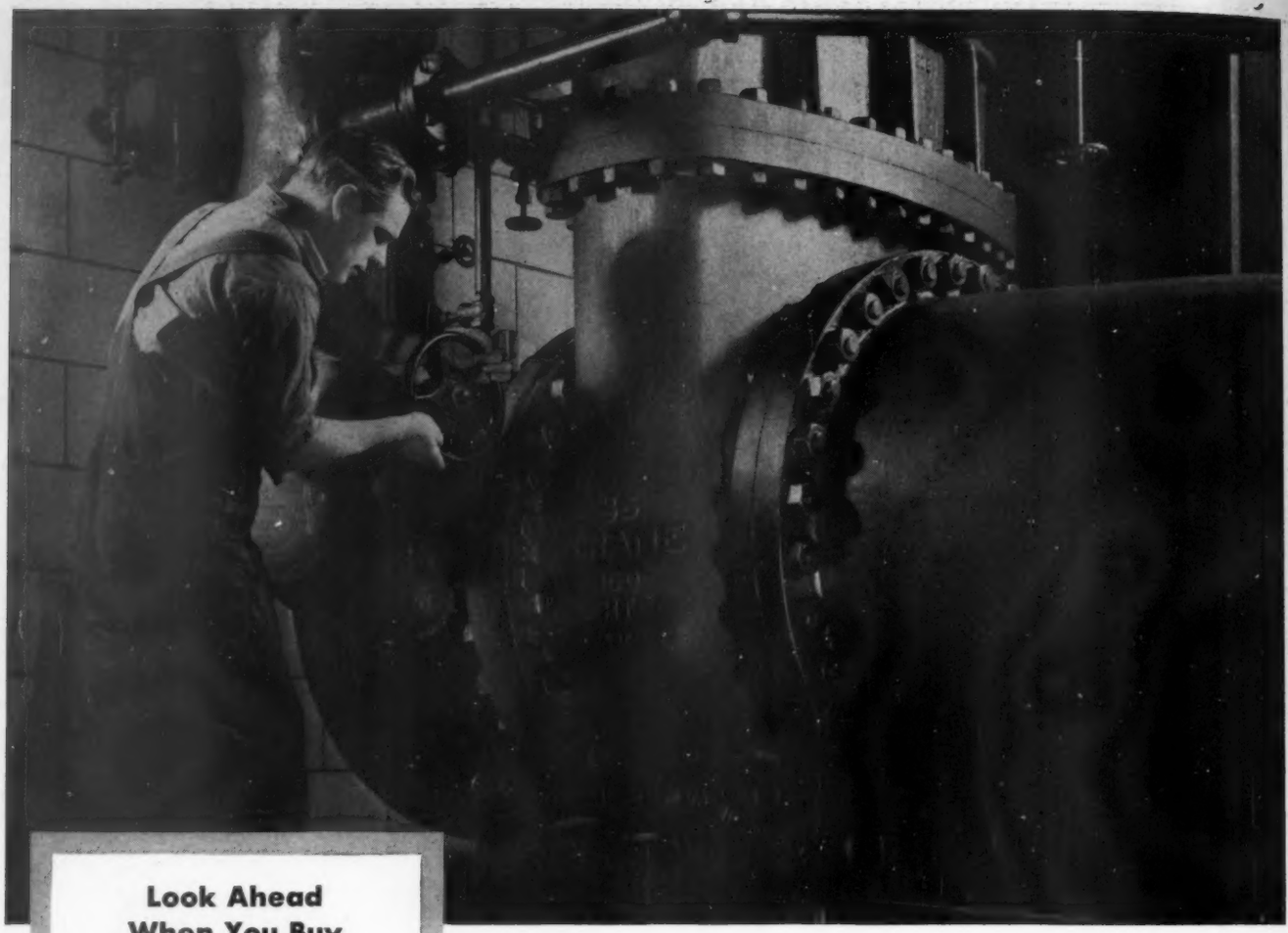

Look Ahead When You Buy Water Works Valves

Your water system makes your city livable . . . is the life-blood of its industry. It's the true foundation of your city's future. Be mindful of this when you buy water works valves—be sure they'll meet tomorrow's needs.

And they will—if you choose Crane No. 480½ A. W. W. A. double disc gate valves. They're built to give that kind of service—scientifically designed for positive action . . . smooth, yet tight and true—through long years ahead.

Ask your Crane Representative for all the money-saving advantages of the Crane No. 480½.

BIG VALVES FOR BIG JOBS IN FLOW CONTROL

WHERE the big job requires a big valve there is, in the Crane line, a valve of just the right size, just the right design to handle it. Here, for example, is a 36-inch gate valve chosen by the waterwork engineers of a large mid-western city to control the flow of water from the pumps into the city mains. It's Crane, of course, for Crane quality is well recognized by experienced engineers as a highly desirable plus value in valves where the requirements are a little exacting—the service a little tougher.

But important as big valves for big jobs are in flow control—little valves for big jobs are important, too. For example ½-inch valves, that just make a handful, control the service line shut-off into homes—special plug disc valves handle the chlorine and give greater resistance to the corrosive action of this gas. But whether it is a valve so large a man can walk through it or so small you couldn't use it for a finger ring—the Crane line covers them all.

Regardless of your requirement—if it is valves, fittings or piping for waterworks or sewage treatment service—you will find it in the Crane line. Turn to your Crane No. 52 Catalog for the details about 38,000 items. Among them you will find an answer to practically any piping problem which you may have. You will also find a large amount of engineering data which may prove very desirable to have handy.

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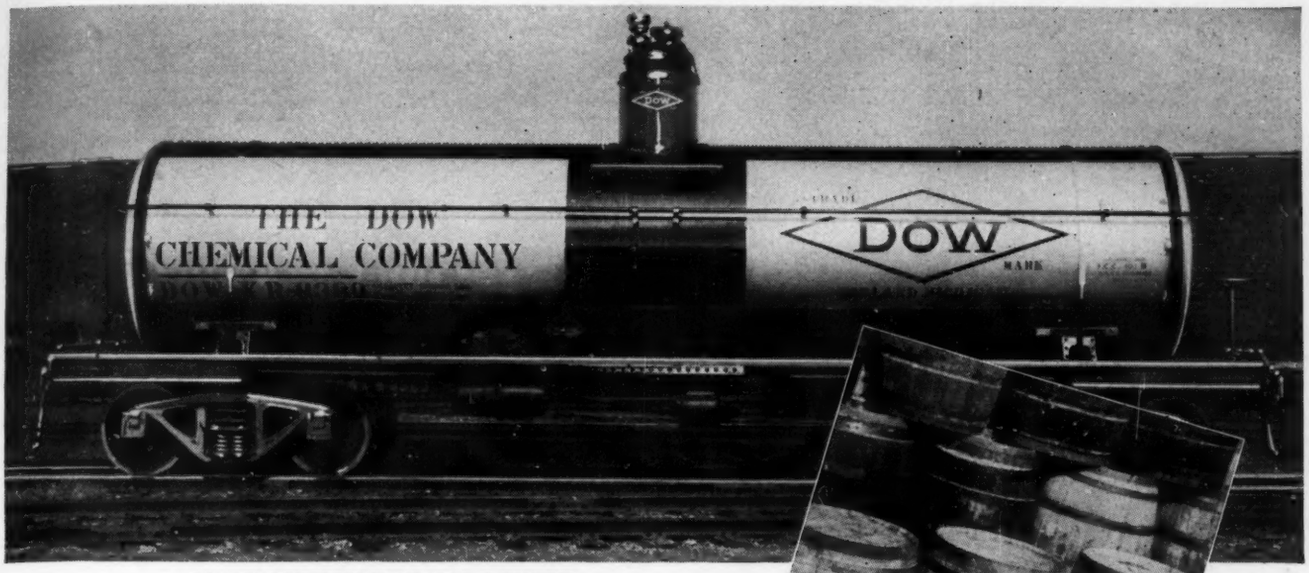

38-45% SOLUTION TANK CAR SHIPMENT

TWO FACTORS largely guide the pencil of an engineer in planning a sewage disposal plant—simplicity and low operating cost. Plants designed to use Ferric Chloride invariably give both.

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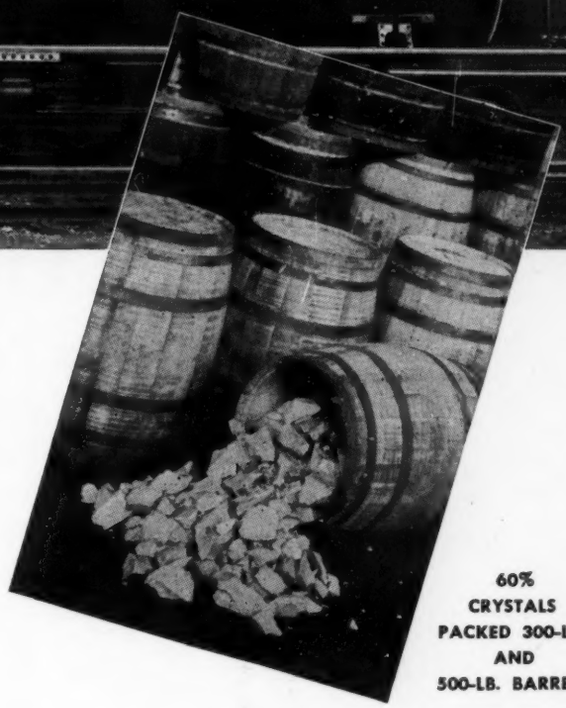
Dow Ferric Chloride is supplied in 38-45% solution in tank cars and 60% crystals packed in 300 and 500 lb. barrels. Dow Technical Service covering design and operating problems of sewage disposal plants is available to engineers. Write today for full information.



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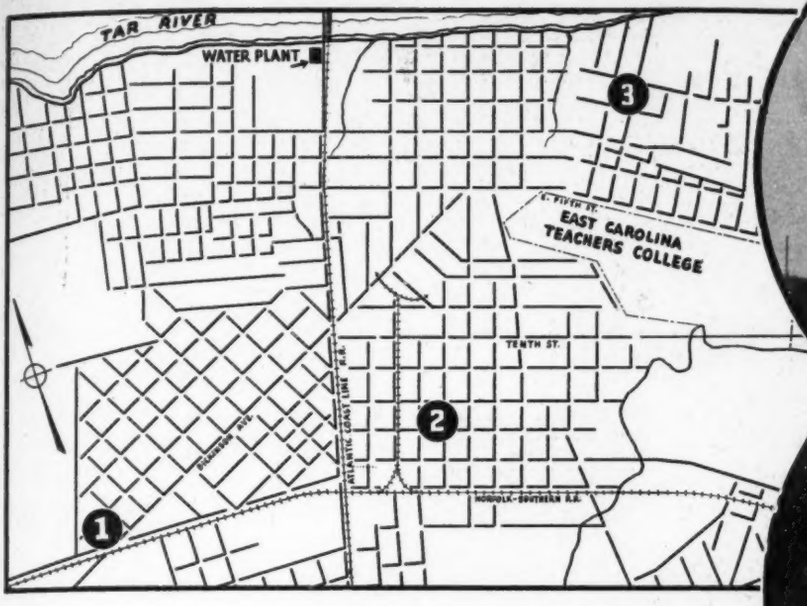

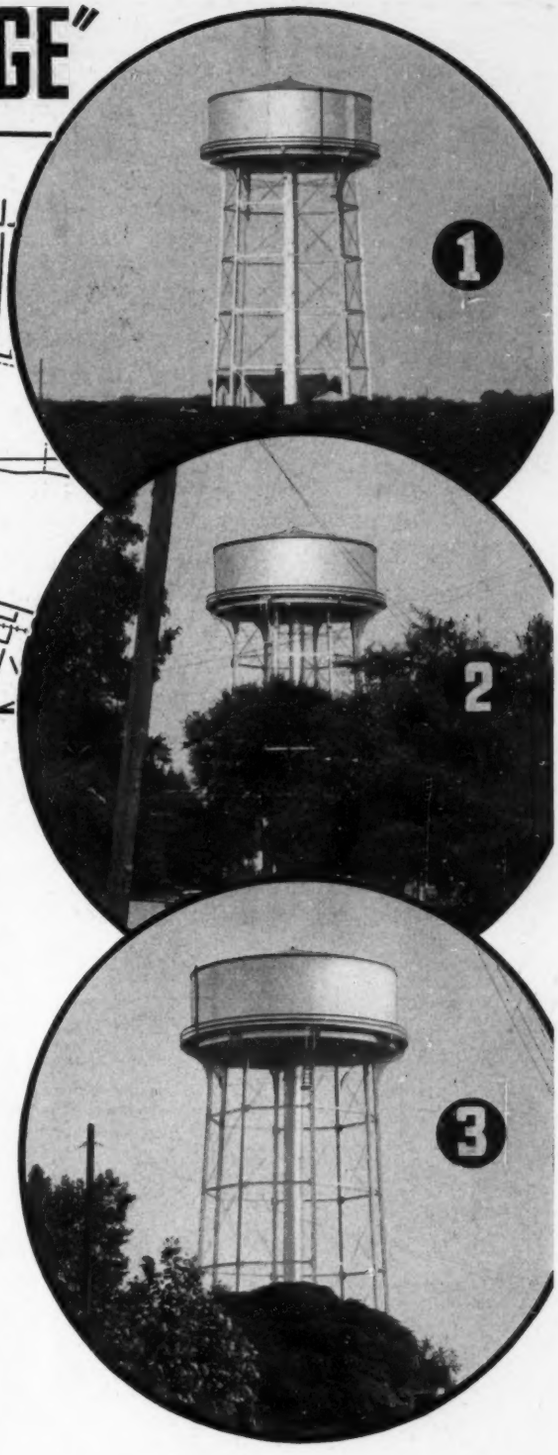

Proves to be Efficient Plan

AN excellent example of the way in which a "distributed storage" plan may be worked out is illustrated by the map shown above. This is the plan used by the city of Greenville, North Carolina, but, because it is typical, its principles could easily be utilized by any municipality confronted with the same problems. In the case of Greenville, one of the major problems was that of low-pressure conditions in the distribution system during heavy demand periods. After careful and comprehensive planning, Greenville decided on the installation of three 300,000-gal. Horton radial-cone bottom tanks, strategically located where they will serve high demand areas to best advantage.

"Distributed storage" is not an unusual practice. The advantages it offers are frequently utilized in municipalities where peak loads for given areas have outgrown the capacity of existing transmission mains. When this situation exists, a single large-capacity elevated tank may be unable to correct low-pressure conditions at any great distance from the tank itself. Thus, by installing two or more tanks of the proper capacity in fairly well distributed areas, the entire water works system is benefited by an adequate gravity water supply.

Let us tell you more about the many ways in which modern elevated storage is helping to improve water supply systems throughout the country. Please address our nearest office for information or estimating figures.

Three 300,000-gallon Horton elevated tanks recently installed in the Greenville, N. C., water works system are illustrated above. Each tank is numbered to show its location on the condensed map of the city at the left, above.

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Houston.....2919 Main Street
Detroit.....1551 Lafayette Bldg.
Philadelphia...1644-1700 Walnut St. Bldg.
Boston.....1348 Consolidated Gas Bldg.
San Francisco.....1083 Rialto Bldg.
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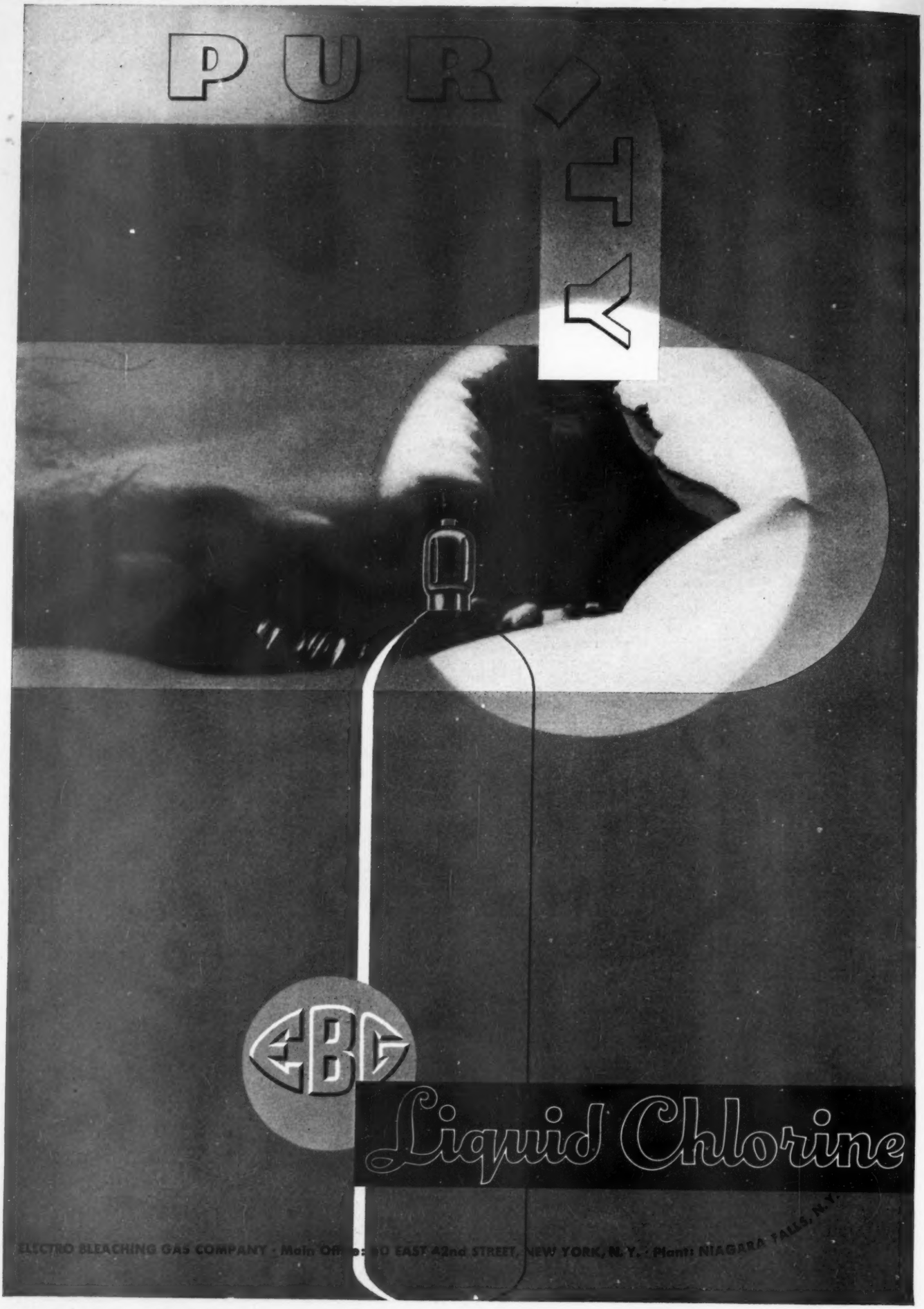
Fabricating plants in CHICAGO, BIRMINGHAM, and GREENVILLE, PA.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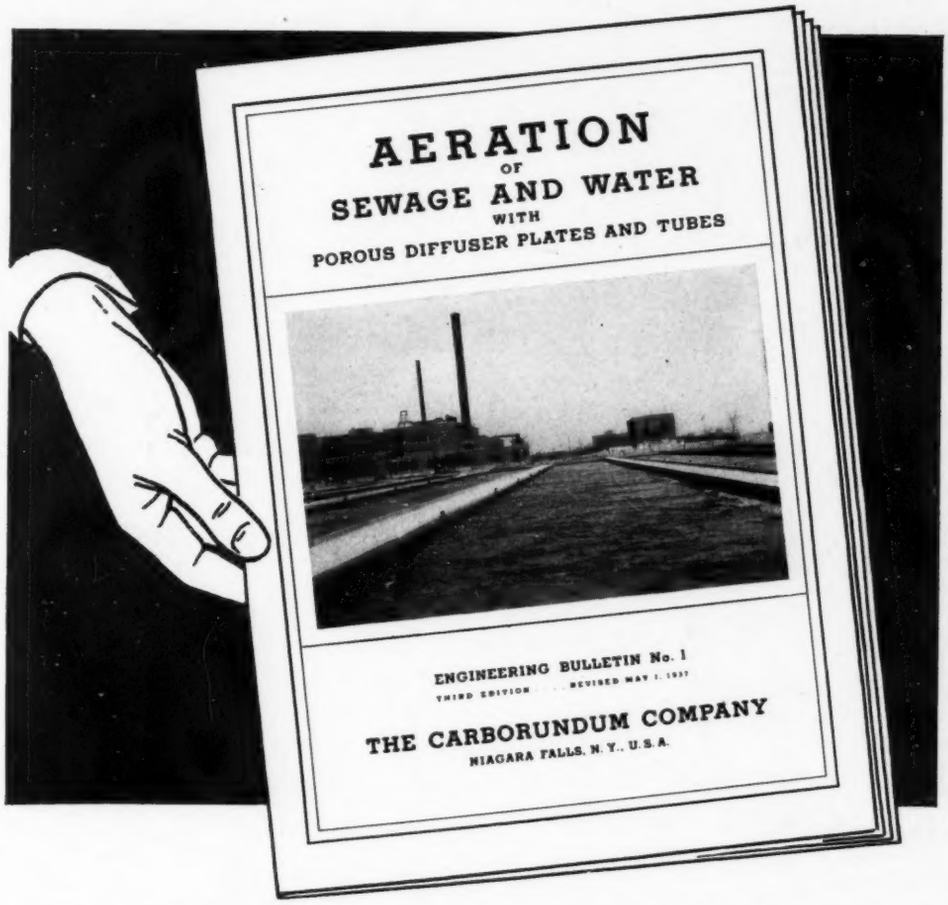

● The Carborundum Company invites every Sanitary Engineer, Plant Superintendent, Chemist and all others engaged in this important field, to send for a free copy of this authoritative and useful technical reference... a revision which has established its worth to hundreds during the past two years. This publication covers all applications of porous diffusers as used in sewage and water treatment plants. It provides the complete information and data essential to the study, design, installation and operation of porous diffusers in such plants. Write for your copy of this valuable bulletin.

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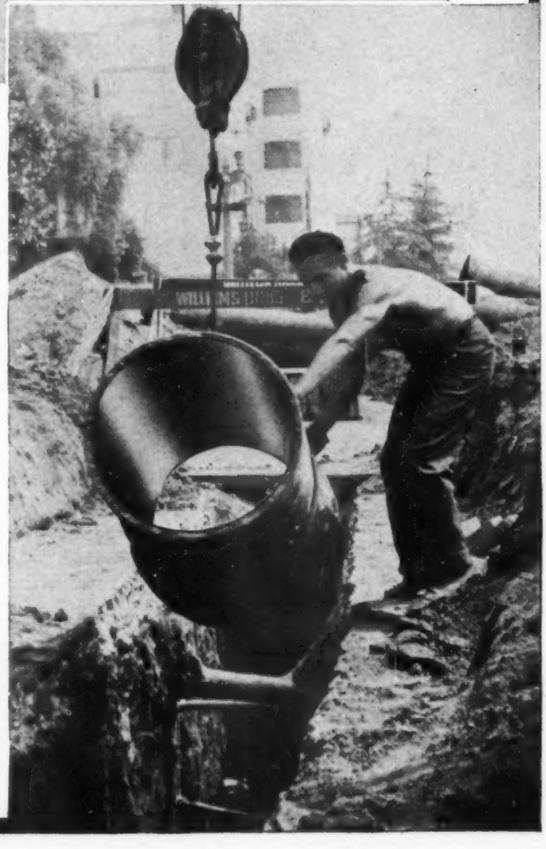

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WATER WORKS & SEWERAGE

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E. S. Gillette, Publisher

EDITORIAL OFFICE
155 East 44th St., New York, N. Y.
L. H. Enslow, Editor

COMING!

"Featuring One of America's Newest Plants." GEORGE S. RAWLINS, Designing Engineer of the new filtration plant of Charlotte, N. C., presents the principal features, novel aspects and innovations in the South's newest water purification plant. His article dealing with design, equipment and operating practice is to appear as the lead article in our next issue.

"Gas Engines in By-product Power Production." A series of articles and discussions on this important phase of sewage works operation, and economics of treatment, are to appear in concurrent issues. The first by NORMAN C. WITTWER, Supervising Engineer of the Rahway Valley, N. J., Treatment Works, will deal with the principles and economic considerations of the practice. Another article by E. D. WEST of Climax Engineering Co. contains a mass of valuable information, as does a discussion by COL. OLIVER F. ALLEN, Consulting Engineer of New York City, with pertinent considerations received by Victor Greiff, E. E., of New York City's Department of Public Works.

"Sludge Dewatering." LE ROY VAN KLEECK, Senior Engineer, Connecticut Department of Health, has been engaged to write a series of articles dealing with sludge dewatering practice and equipment. Based on experiments, experiences and operating results at representative plants practicing vacuum filtration, Mr. Van Kleeck's facts and evaluations from the standpoint of design, materials and operating practices, constitute the most valuable discussion of this topic yet written.

"Solving Operating Problems—Kinks and Gadget." D. R. TAYLOR, Plant Superintendent, Roanoke (Va.) Water Department, in March presents the third of his personalized "Dear Bill" letters from one "Super" to another. Mr. Taylor has agreed to contribute a series of these "letters" on ideas, kinks and gadgets in everyday water works operation and maintenance. [We join the author in urging reciprocation by other operators. More of these "open letters" from our readers will be welcomed. Let's keep "Doc" Taylor's ball a-rolling.—Ed.]

"A Scheme for Promptly Revealing the Location of Main Breaks." Is a contribution from the late ALFRED F. THEARD, Gen'l. Sup't. and Engineer of the New Orleans Sewerage and Water Board. Received but a short time before his passing, this article is probably the last from an author who has contributed much of value.

"Why Should Water and Sewage Utilities Be Managed and Operated Jointly?" Concerning joint management of the two essential "hydraulic utilities" we have asked two long experienced managers (of far separated systems) to give us the important answers to the above question. THOMAS L. AMISS, Sup't. of Water and Sewerage at Shreveport, La., and HAROLD L. BRIGHAM, Sup't. of Water and Sewerage, Marlboro, Mass., in separate articles, will reveal and discuss the good and the bad features (if any) of such joint management.

DR. ING. KARL IMHOFF, "father of the Imhoff tank," and world renowned sewerage authority, is contributing an interesting article on what's new in "Sewage Disposal in Germany."

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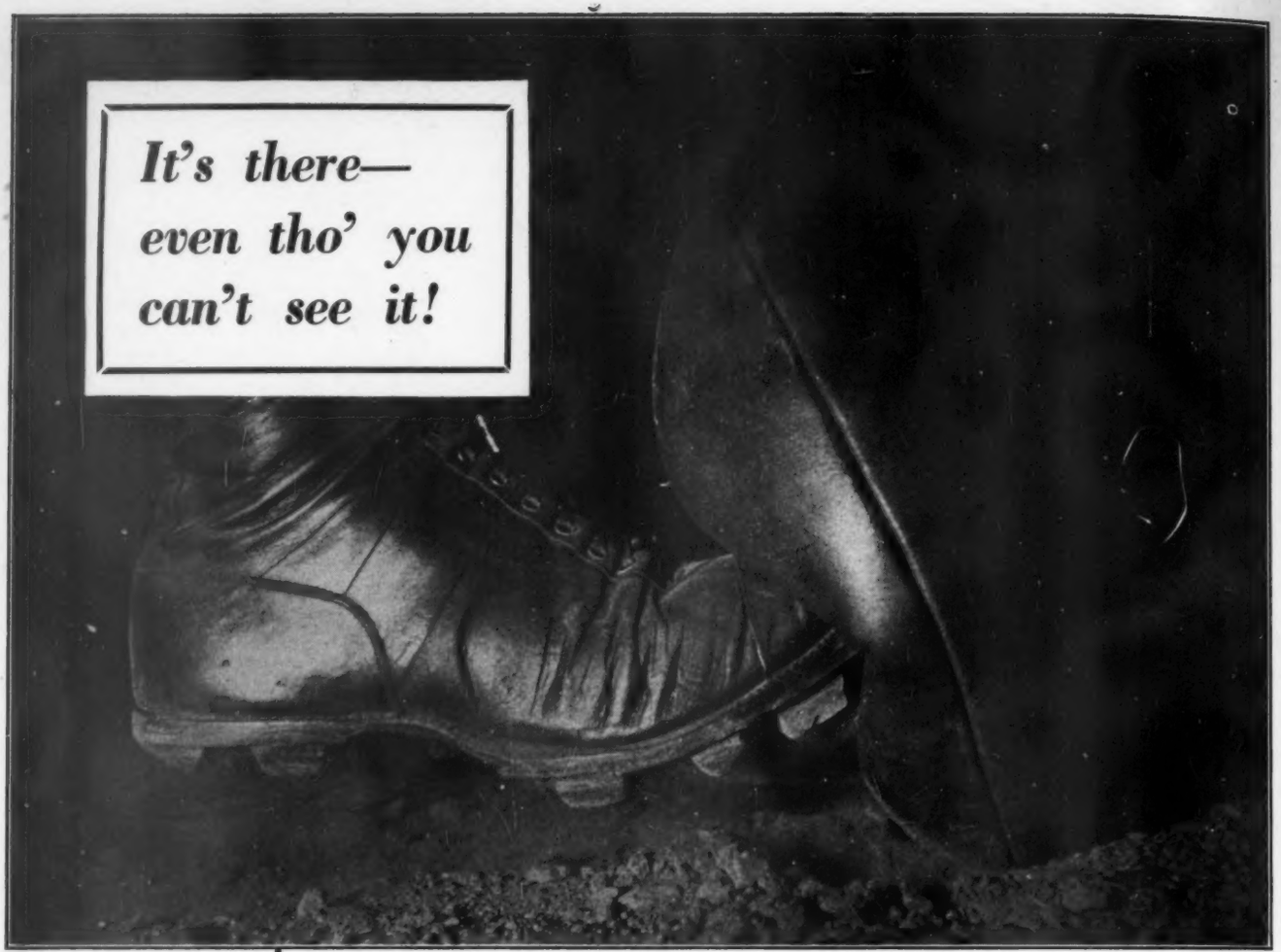

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WATER WORKS & SEWERAGE

VOLUME 86, NO. 2 *A Gillette Publication* FEBRUARY, 1939

PROGRESS IN SEWERAGE AND SEWAGE TREATMENT

A Year-End Recounting of American Developments and Trends in Sewerage and Sewage Treatment Practice

By LEWIS V. CARPENTER
Professor of Sanitary Engineering, New York University, New York City

The Author

EACH February, an article appears in this magazine that gives the "State of the Nation" in respect to sewerage and sewage treatment. Similar to the President's annual message, the review now to be presented is expected to give the "State of Sewage Disposal." Unlike the President's annual message, no attempt will be made to forecast what is going to be done but to review what has been accomplished.

Regardless of political affiliations or the like or dislike of the reader for the administration of the various alphabetical bureaus of our government, certainly through these the necessary impetus has been applied to make the past several years one of the most important periods in history in respect to construction of new sewerage systems and disposal works. During the period 1932-1938, there have been constructed better than 1300 new sewage plants serving about 19,000,000 people. It is interesting to note that of the new plants built during this period, all but 11 in every 100 were constructed under Federal aid, with the Government paying from 45% to 90% of the cost. It is easy to see what a factor Federal backing and assistance became in our program of improved sanitation.

It is interesting to note that slightly more than one-half of the population of the United States disposes of its sewage through a domestic sewerage system. Of the 73,000,000 people served with sewers, about 19,000,000 give their sewage primary treatment, about 21,000,000 more complete treatment, and the remaining 33,000,000 discharge their sewage into nearby water courses without treatment.

Wolman, before the Maryland-Delaware Water and Sewage Works Association, stated that as of 1938, "approximately 72 million people in the United States were being provided with sewers. Of the 72 million, approximately 37 million are provided with effective sewage treatment whereas five years ago that figure was under 20 million. Today, there are over 3,700 major sewage treatment plants; five years ago, there were about 2,900 sewage treatment plants."

[Now reported to be 4,662 treatment plants of all descriptions serving 40,885,000 people in the United States.—Ed.]

It has been estimated that quantities of sewage delivered by sewerage systems daily are as follows:

	Billion gallons daily
Untreated sewage direct to waters	2.5
Primary treatment	1.5
Complete treatment	1.7
	5.7

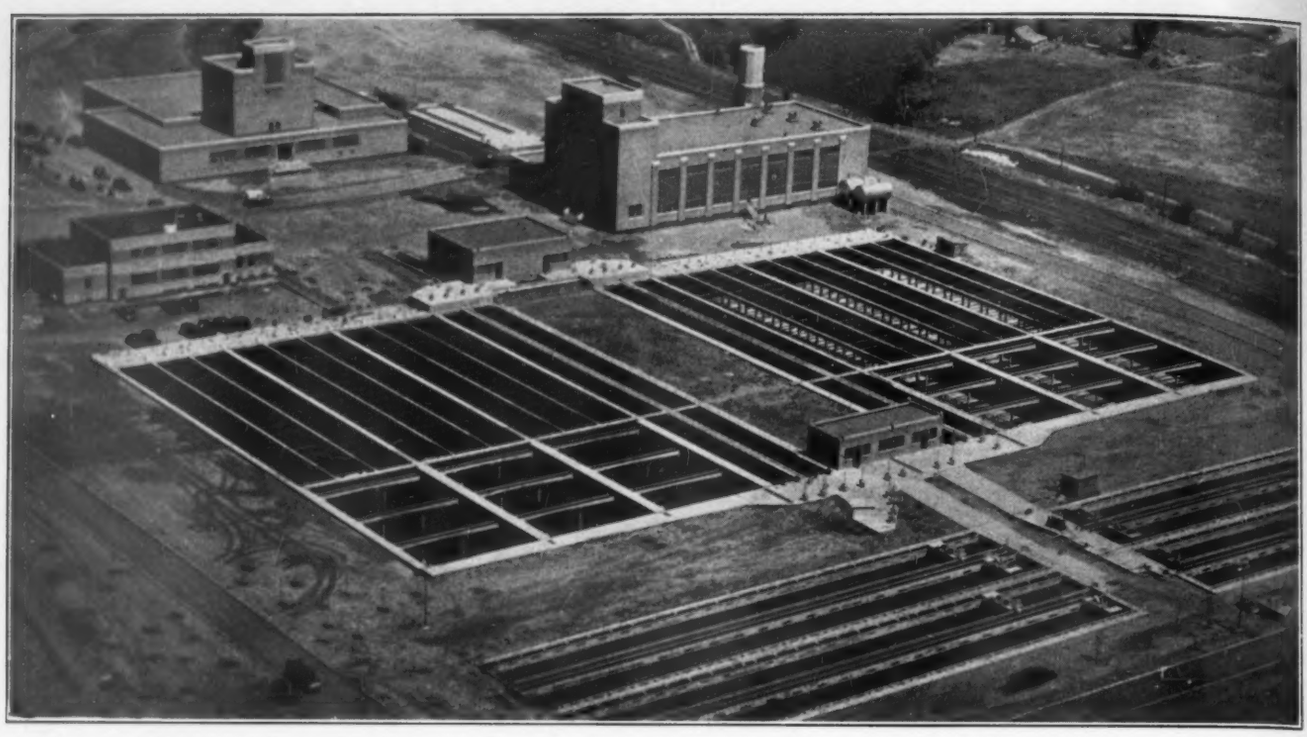
We are proud of what has been done but we must realize that only about one-half of the population is served with sewage treatment facilities and less than one-third of the sewage is given complete treatment. By the time we get all of the sewage treated we will have to start rebuilding obsolete and inadequate plants. It does not seem reasonable, then, that we will ever get "caught up" in respect to sewage treatment. At the same time the treatment of industrial wastes is just in its beginning stages.

Sewer Maintenance

The City of Los Angeles demonstrates the truth of the old proverb "a stitch in time." Now all sewers are inspected at least once every six months and if records indicate the need for it, those sections are re-inspected every three months. It is then possible to see and remove small obstructions before the sewer is stopped. The number of stoppages now recorded on the Los Angeles system is now less than 100 annually on 3,000 miles of sewer.

Infiltration into the sewers in Janesville, Wis., was quite high. By erecting a series of small dams within the intercepting sewers it was possible by the use of water ejectors, which delivered the sewage upstream to a bypass manhole, to repair the sewers essentially in the dry. The joints were caulked with precast strips of lead from the inside and infiltration was thus reduced by 5 m.g.a.d.

South Augusta, Ga., constructed sand traps in the



The New Twin-Cities Chemical Precipitation Type Treatment Works Serving Minneapolis and St. Paul, Minn. (This plant's chain and scraper type settling tanks are possibly the world's largest—200 ft. Magnetite filters (strainers) polish the effluent.)

sewers. These were found effective, particularly where the grade was flat and there was danger of depositing the sand in the sewers.

Sewer cleaning equipment has been improved, more use is being made of labor- and time-saving power

Surface of Aerated Grease Separation Tank. (Pictures the effects of "Aero-Chlorination" in increasing grease floatation.)

driven equipment, more attention given to ventilation and safety in inspection and maintenance work.

Sewer Rentals

The sewage disposal plant has frequently been the stepchild of the City finance officials. Now that 32 states have enabling acts to build sewerage works and 25 states are taking advantage of these acts and charging sewer rentals, it looks as though budget problems can be more easily adjusted. Sewer rentals have been applied for paying for construction of sewage plants as well as for operation and maintenance. In addition to the 32 states having legalized sewer rents, there are cities in seven other states which are charging rentals, either through charter provisions or interpretations of existing state laws. Columbus, Ohio has a schedule of charges which takes into consideration not only the quantity of sewage but its quality as well. For example, the first 3,300 cu. ft. of sewage per month, the charge is $0.245 if the B.O.D. is 200 p.p.m. or under, while the same quantity carries a charge of $0.58 if the B.O.D. is over 500 p.p.m.

New York has been added to the states which require licensing of sewage plant operators. The first year's operation of their new regulation has found the operators eager and ready to comply with the law. Three schools at three different universities were held to give men special instruction in sewage treatment.

In the earlier days of sewage disposal, the value of adjoining communities banding themselves together into Sanitary Districts was appreciated. Now, under the guidance of the Water Resources Committee, many compacts have been formed linking together several states for the control of stream pollution on certain watersheds. Tisdale, formerly State Sanitary Engineer of West Virginia, has recently been transferred to Cincinnati with the U. S. P. H. S. as executive engineer to carry out a pact between eight states to reduce the pollution on the Ohio River Basin. The work on the Delaware River pact is progressing as well as the Interstate Commission on the New York Harbor. The City of Philadelphia has been ordered to treat its sewage. Detroit is now constructing treatment works, and St. Louis and New Orleans are the only cities of the big six that apparently has not been confronted with the problem of pollution abatement.

Last year (1938) marked the 10th year for the Federation of Sewage Works Associations and it is interesting to note that during that time the Sewage Works Journal has developed into a "Bible" on sewage problems and is now self-sustaining. State meetings on sewage disposal broke new records for attendance. The Federation has just produced a 10th Anniversary

Volume which serves as a manual of "Modern Sewage Treatment Practices."

Sewage Gas Hazards

An investigation of the serious explosion at Dayton, Ohio revealed that the escape of sewage gas through the blowing of the U-tube water sealed traps in the gas line was the most probable cause of an explosion which badly damaged the sewage plant on Nov. 12. The explosion ranks as one of the most violent on record and it is indeed fortunate that it occurred after the night operator had made his last trip through the galleries and control houses. The reinforced concrete influent and effluent conduits and the roof of the gallery were almost completely demolished. The walls of both control houses were thrown outward allowing the roof to fall down and do considerable damage to the machinery.

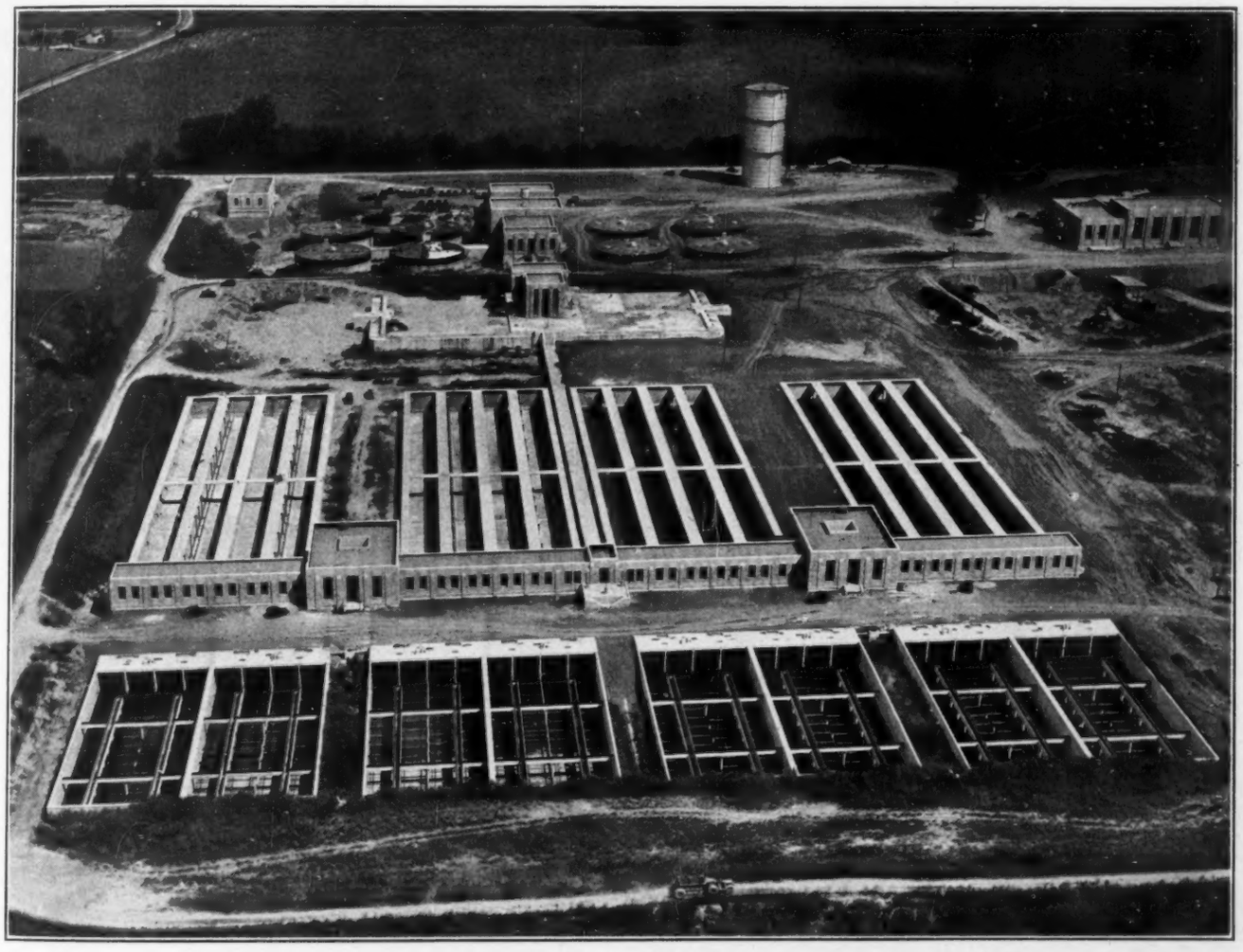
At Monmouth, Ill., the operator had taken down a condensate trap for servicing and the heap of "black dirt" was a glowing mass in a very few seconds. The material was apparently iron sulphide which may be produced when hydrogen sulphide attacks steel. It oxidized in the presence of air and sufficient heat may be generated to cause ignition. *The Digestor*, a publication of the Sanitary Division of the Illinois Department of Health, reports another incident at Macomb, Ill., where the operator noticed the volume of gas had decreased from the digestor and lit a match in the basement and was greeted with a flash of flame. Fortunate for the operator that there was a burning mixture rather than an explosive mixture. Safety should be foremost in the design of sewage plants as the gas hazard is always present.

Hatfield of Decatur, Ill., presented a paper "The Viscosity of Pseudo-Plastic Properties of Sewage Sludges" which was not only scholarly but gives much valuable information on that vexing problem of frictional losses in pipe lines carrying sludge.* The apparent viscosity when plotted against the rate of flow, or the percent solids produced a straight line on logarithmic coordinates. This gives encouragement, because if some quick feasible method of determining viscosity (even if the sludge is pseudo-plastic) we can calculate Reynolds' number and make use of the vast amount of experimental data we have on fluid flow to solve sludge flow problems.

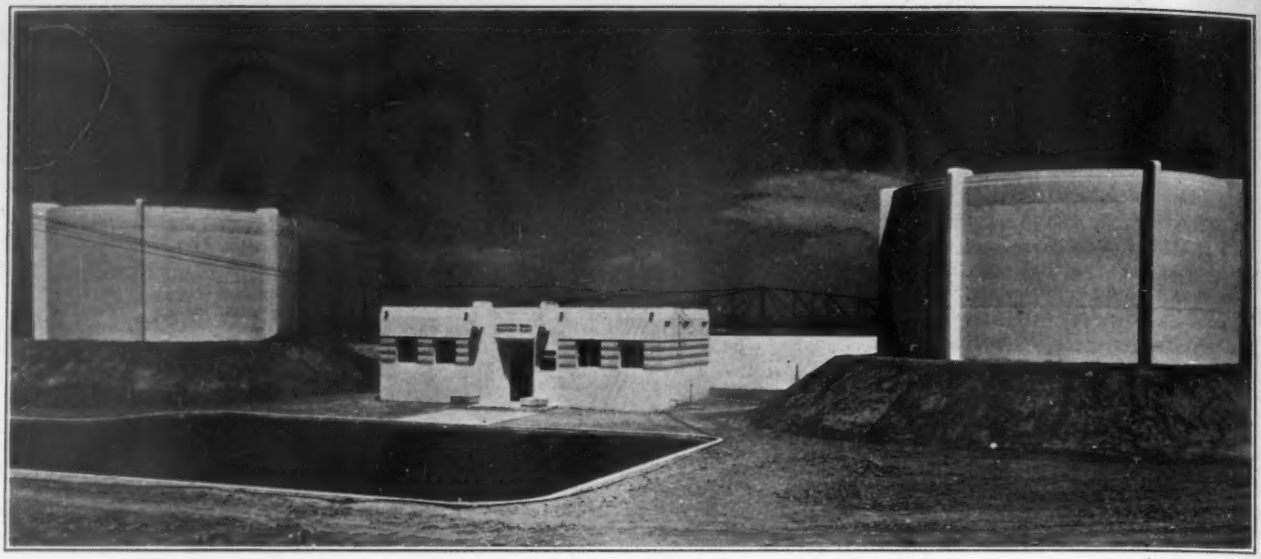
Research

The U. S. Public Health Service Laboratories contributed several articles of value on sewage purification —particularly the activated sludge process. In an article presenting some observations on the effect of variations in the initial numbers of bacteria and of the dispersion of sludge flocs on the course of oxidation of organic material in pure culture the following note-

*For his paper Dr. Hatfield received the annual award of the Central States Sewage Works Ass'n.—Ed.



In 1938 the New Activated Sludge Plant of Columbus, Ohio, Went into Operation. (Robert A. Allton, Designing Engineer.) Artist's Sketch of New York City's New Tallman's Plant—Soon to Go into Service.



The Sewage Treatment Works of Huntington Beach, California.
(Offers a splendid example of the effective use of modern architectural concrete and symmetry. Another case is that of Hartford, Connecticut, battery of sludge digesters.)

worthy conclusions were stated concerning the mechanism of biologic oxidation:

(1) "The rate of oxidation of bacterial food during the early hours of incubation is dependent on the number of living units of bacteria present at the start; the greater the initial numbers the more extensive the initial oxidation." (2) "The rate of oxidation is also influenced by the degree of dispersion of bacteria, or bacteria flocs, in the presence of a dispersed food; adequate dispersion is required to produce extensive oxidation."

Butterfield, in these studies, isolated organisms in pure culture from activated sludge and by adding them to sewages found that they produced a high rate of oxidation of carbonaceous materials, obtaining a 50% reduction in 24 hours. The nitrogen was not affected. Who knows but that the sewage plant engineer of the future may make his rounds of aeration units giving a dose of bacteria from a test tube. One of his big jobs may become that of "bugoculturist."

Keefer and Kratz, at Baltimore, reported that they found lime more effective, on the whole, than activated carbon in increasing the speed of digestion. Previous results at Baltimore, reported a year ago, indicated that carbon hastened digestion and other results at Cleveland seem to indicate that there is an optimum dose of carbon for improving digestion; and, that this optimum proved to be 4 to 8 p.p.m. Much conflicting information of the use of carbon in sewage disposal plants has been published. However, the fact that carbon has a definite use at sewage plants for odor control seems to be proved —notably in connection with sludge handling at the Wards' Island, New York City plant and elsewhere.

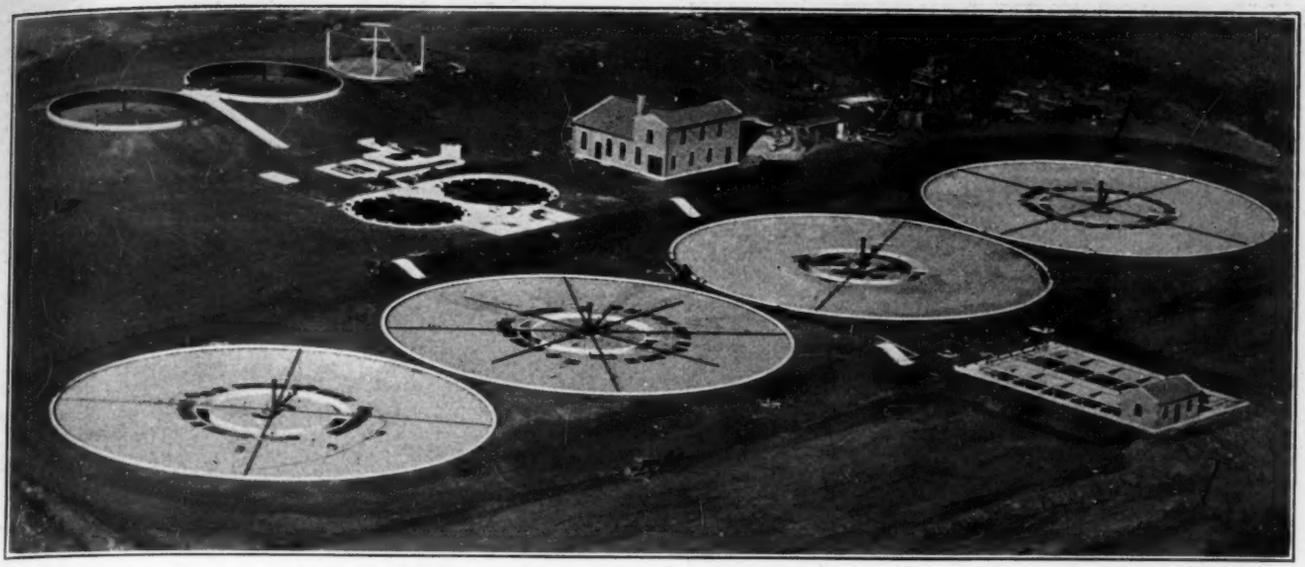
All progress during the year was not forward but some might be dubbed—"back to nature" developments. For instance, at Medina, Ohio, excavations for sand filters were made, but delay in construction caused a heavy growth of grass to appear on the floor of the excavation. Settled sewage was diverted, cross-flow wise, through the incomplete sand filter bed. Interestingly a marked improvement in the quality of the settled sewage was noted. Result—this device was included in the design of the plant by the consulting engineer, and it developed that certain types of grasses or weeds were more effective than others for purification. So, in 1938 midst. "Stream-lined" treatments, we go back to nature and provide a "grass-colloider" to vary the theme of speed and push-button technic.

A recently constructed plant for Hyannis, Mass., provides for preliminary sedimentation followed by what was the vogue of past generations—slow sand filtration. Concerning this plant E. Sherman Chase says: "Somewhat unfashionable, perhaps, but nevertheless effective and suitable." The soil beneath the intermittent sand filters was extremely porous and it was anticipated that there never would be an effluent. Drains were provided but so far no effluent has appeared. So, like the 1939 styles of the fairer sex, we find that we can still use ideas of our forefathers, and many times to good advantage.

Chlorine in Sewage Treatment

Chlorine is rapidly occupying an increasingly important place in sewage treatment, in addition to its long satisfactory history in water purification. Faber, of the Chlorine Institute, reported results of experiments in 1937 at the Woonsocket, R. I., treatment plant where gaseous chlorine was injected into the air pipe serving the grease separation tank. These experiments

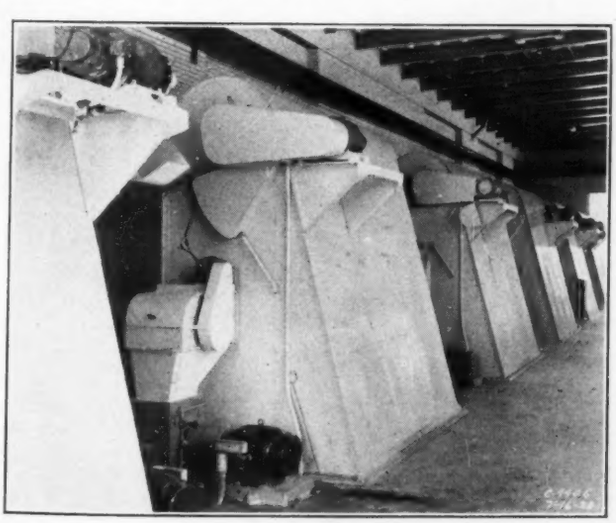
A Good View of the New Swing Type Air Diffuser System, such as installed at Cleveland, O., Lake Charles, La., and elsewhere.



A Striking Air View of Fort Dodge's (Iowa) New Plant Filters Equipped with 151 ft. "P.F.T." Rotary Distributors. (Buell and Winter, Sioux City, Iowa, Consulting Engineers.)

indicated that when 1.5 p.p.m. of chlorine (based on sewage flow) was fed into the air an increase of grease removal from 189 to 442% (depending upon the day of the week) was obtained as compared to results from the use of air alone. Keefer and Cromwell, at Baltimore, have since reported on similar experiments. The findings revealed chlorinated air to be more effective than straight air by margins ranging from 149 to 847%. The Baltimore results showed that with such chlorination procedure a period of aeration of 5 minutes was as good, if not better, than one of 10 or 15 minutes. The average quantity of air used was 0.064 cu. ft. per gallon of sewage. Weist still more recently reports that at Lancaster the period of "Aero-chlorination" was limited, by plant design, to between 3 and 4 minutes, and that 2 p.p.m. of chlorine proved ample in conjunction with 0.1 cu. ft. of air per gallon. Pre-aerated for 6 minutes and grease skimming from primary clarifiers has been adopted at Cleveland with provision for adding chlorine to the air lines. Buffalo and other plants are equipping for such use of chlorine—indicative that "Aero-chlorination" has arrived as the newest chlorination adjunct in sewage treatment.

At Flora, Ill., extremely concentrated and septic sewage combined from wastes from a milk products plant, resulted in severe bulking due to filamentous growths. Chlorine applied at the rate of 5 p.p.m. to the returned sludge materially improved conditions; and Phoenix, Arizona, and Houston, Texas, report similar experiences with chlorine as an aid to distressed activated sludge.



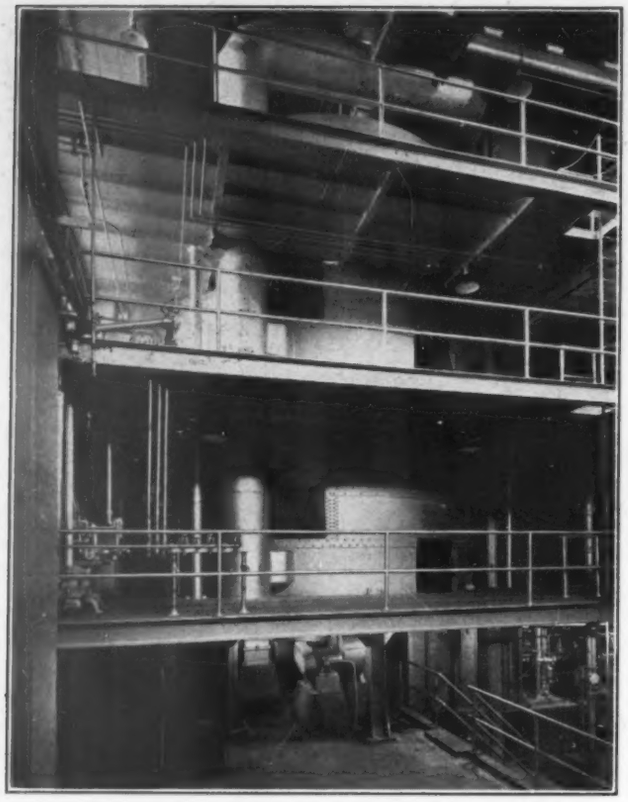
Battery of 6 "Rex" Screens and Screenings Triturators in Buffalo's New Treatment Works.

Disinfection to destroy pathogenic and other bacteria still remains the most important function of chlorination. But it is being used also to prevent or delay septicity of sewage; to suppress the multiplication of sulphate splitting organisms; to prevent acid disintegration of sewerage structure, in checking bio-activity in sludge thickening, and for the correction of bulking in activated sludge plants.

Studies on chlorine demand of sewage made by Dr. Symons at Buffalo have revealed much basic information of value. For preliminary design purposes, they arrived at a figure of 0.005 pounds of chlorine demand per capita per 24 hours as the local factor. Temperatures between 12 and 24 degrees C. had little effect on the demand, but at lower temperatures the demand was lower. The chlorine demand was dependent on the age of the sewage and the amount of industrial wastes. For Buffalo (primary treatment), prechlorination was adopted after studies indicated that a 30 to 40 minute contact period (with a residual chlorine content of 0.1 p.p.m. in the supernatant after 15 minutes) produced practically no increase in the 15 minute chlorine demand of the settled sewage, and effected a bacterial kill of 99.6 to 99.8% regardless of temperature, concentration of sewage, chlorine demand, or the number of bacteria present. Because of the assets of long contact periods, voiding expensive construction of contact tanks, economy and other advantages, prechlorination of the incoming sewage has been adopted.

Activated Sludge

The trend toward the use of the activated sludge process for plants supplying complete treatment has been quite marked. However, the problem of bulking is still with us. In Ontario, California (first circular form activated sludge plant designed by Currie of San Bernardino), bulking is corrected by adding a quantity of dirt to the tanks. This weighting down process is not new but has been effective in a number of plants.



Nichols-Herreshoff Incinerators at the New Minneapolis-St. Paul Chemical Treatment Plant.
(One of three 8 hearth units, with combined capacity of 180 tons of dry solids—720 tons filter cake—per 24 hours.)

Hazeltine found that lime was very effective for bulking sludge—i.e., provided bulking was due to inadequate oxygen supply or insufficient time for biological oxidation. He concludes that the use of lime offers a ready means of absorbing the slude lifting carbon dioxide produced in biological oxidation and seemingly constituting an interference if not eliminated by physical or chemical means.

More and more plants are cutting down on the quantity of air used in activated sludge plants and have found that B.O.D. of effluents remain satisfactory. In explanation Mohlman has stated: "This occurred because of the phenomenon of two stages of B.O.D., wherein the rate of oxygen consumption greatly increases in the first few days of nitrate production, later to taper off again as in the carbon oxidation stage. If effluents are just at the point of incipient nitrate production, the 5 day B.O.D. may (actually) be much greater than if the oxidation is still well down in the carbon stage."—Later he says: "It seems preferable to hold the degree of oxidation to the carbon stage, and to allow slow nitrification to take place in the stream."

Lockett, from Birmingham, England, offers the following remedy for sludge rising: (1) Thorough conditioning or activation of sludge in mixed liquor before passing mixed liquor into the final tanks. (2) Continuous flow treatment in an aeration tank so designed as to eliminate short circuiting. (3) Reduction of detention in the final tanks to a minimum since all nitrifying sludges have a tendency to rise after some hours of non-aeration.

Activated Sludge Plants

A new activated sludge type of sewage treatment plant using double deck aeration tanks was recently completed at Barking, England. The sewage-sludge mixture is circulated by paddles through 66 two-tier channels. The plant was designed to produce a partially stable effluent. There are 6 aeration units, each with 11 channels and the liquid is passed alternately through upper and lower compartments until it has traversed all of the 66 channels. Excess sludge is mixed with primary sludge and digested.

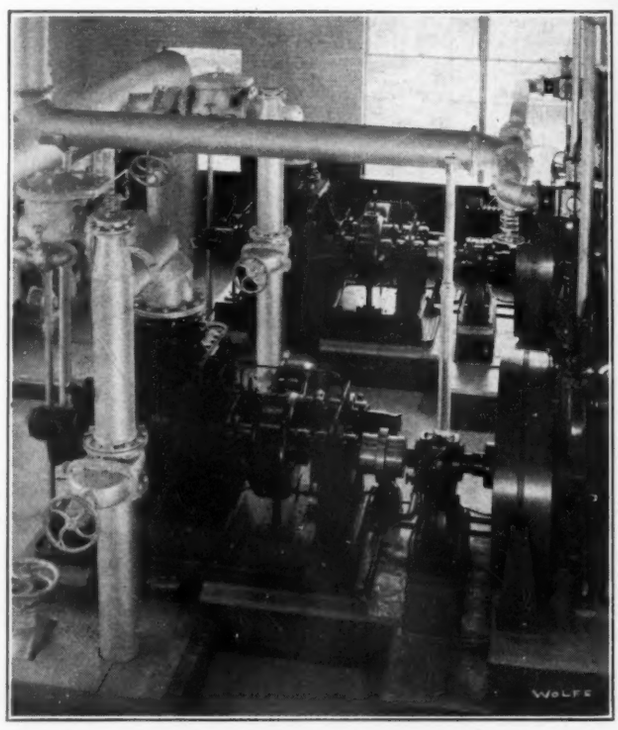
Dedication of the Easterly Sewage Works, at Cleveland, on August 31, added an activated sludge plant with a capacity of 123 million gallons per day to the impressive list of large plants of this type. Tapered aeration will be given a thorough trial at this plant. Primary and excess activated sludge will be pumped 13 miles inland to the Southerly plant where it will be digested, dewatered, and incinerated.

The first activated sludge plant in Louisiana was completed at Lake Charles and is designed to operate on the tapered aeration principle. It is equipped with the new swing type diffusers as is one of the Cleveland plants.

Columbus during the year placed its new 50 m.g.d. activated sludge plant in operation. An innovation at this plant is the attempted concentration of excess and return sludge by centrifuges. The construction of New York's 40 m.g.d. Tallmans Island plant is essentially completed. It will boost America's largest gas-engine installation involving 8 engines developing 3500 H.P. driving pumps and blowers.

Greensboro, N. C., completed a combination chemical precipitation-activated sludge plant of unusual flexibility, to treat domestic and textile wastes. It also includes separate sludge digestion and facilities for elutriation of sludge prior to dewatering it on vacuum filters. The complete plant has: comminutors, grit removal and washing, chemical precipitation, primary clarification, activated sludge, final clarification, chlorination, sludge digestion, elutriation, vacuum drying, and gas utilization. The plant is notable for its flexible operation. By proper manipulation of valves, a variety of flow sheets are available.

The Niagara Falls plant has been an interesting



Typical of Increasing Use of Gas Engines Direct Connected to Air Blowers. (This Installation at Topeka, Kan.)

plant, due to the fact that the original design was such that numerous changes had to be made after the plant was partially placed in operation. The centrifugal dewatering machines had to be removed because they did not meet the guarantee. Originally coal-mat covered screens were to have been operated with a 1 to 3 inch mat of fine coal, which was to have acted as a coal filter. "The engineers state that they have been able to operate the filters successfully by using a ¼-⅜ inch mat of fine coke, the entire mat being removed at each rotation of the circular filter." The specifications call for 30% removal of solids. Solids collected on the screens, together with the coal removed, were to have been centrifugally dewatered and passed to two 80-ton multiple-hearth furnaces.

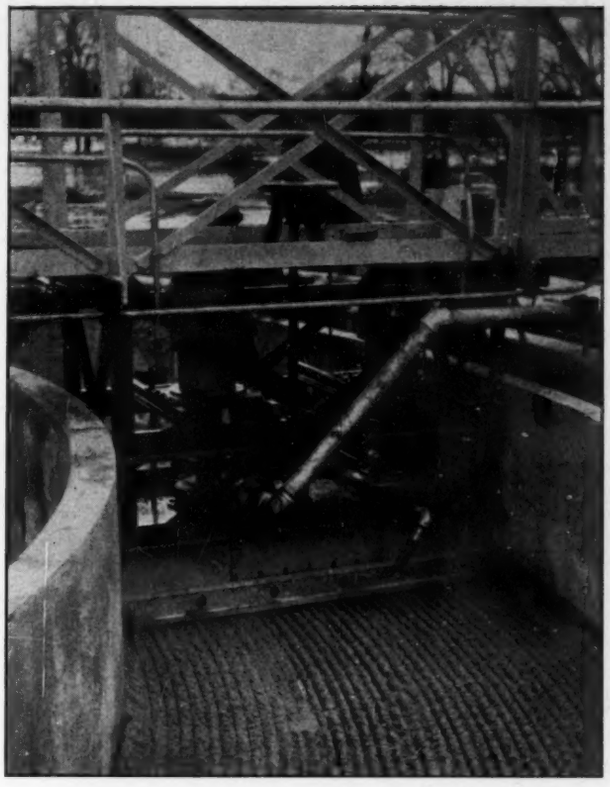
Buffalo placed in operation its new 150 m.g.d. plant providing sedimentation and chlorination. The sludge will be partly digested, filtered on vacuum filters, and incinerated in incinerators of the flash-drying type, using powdered coal as the auxiliary fuel.

Detroit has passed the half-way mark on one of the largest plants in the world which will ultimately provide sedimentation and chlorination for 420 m.g.d. Sludge will be dewatered and incinerated.

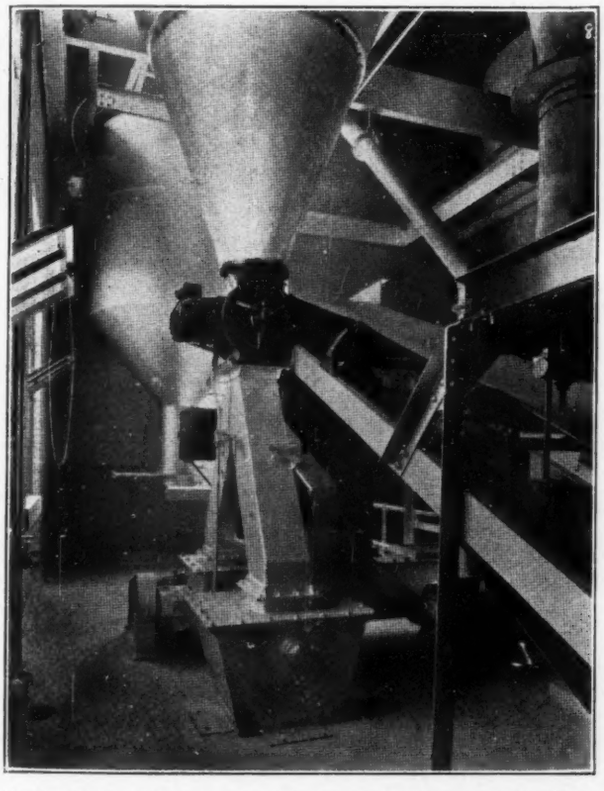
Garbage with Sewage

During the past few years, the subject of garbage-sewage mixtures has been very much before us. Now it has become a reality because several plants are considering treating the garbage with the sewage. Further studies of Rudolfs demonstrated the feasibility of digesting garbage with sewage solids.

The new sewage treatment plant at Lansing, Mich., includes facilities for grinding garbage and digesting it with the sewage sludge. Sewage passes through comminutors and then into the pre-aeration tank where it is aerated for 10 minutes. Grease and scum floated by pre-aeration are skimmed from the sewage in the clarifiers and pumped either to the digestors or incinerators. Secondary treatment involves the activated sludge process. The garbage is collected in standard cans supplied by the city. It is ground and added directly to the digestion tanks by gravity. Sludge is dewatered on a vacuum filter and incinerated.



Automatically Cleaned Sand Effluent Strainer.



Flash Sludge Dryer and Cyclone (C. E. Raymond System) at Neenah-Menasha, Wisc. (Same System serves large Buffalo Works).

Chemical Treatment Increasing

The $16,000,000 sewage treatment plant for St. Paul, Minneapolis, was placed in operation this year. The plant provides screens, grit chambers, flocculation settling tanks, and effluent filters. Sludge will be incinerated following vacuum filtration. The plant during low flow will employ chemical precipitation. The average flow is about 134 m.g.d. This plant has a daily chlorine capacity of 30,000 pounds, the largest single installation in the world. When chemicals are needed, they propose to use chlorinated-copperas as the coagulant.

Atlanta, Ga., recently completed the largest of its four new treatment plants providing chemical precipitation when required. This, the Clayton plant, was designed for a 42 m.g.d. rate and in addition to the conventional plant with sludge digestion and vacuum filtration of sludge, it has diffused air flocculating chambers following flash mixers. The two covered chambers, of spiral flow design, are exhausted through a duct and fan system into a ventilating stack.

Chemical precipitation and bio-chemical processes have come in for their share of new installations during the past year. Gehm reports some experiments on bio-flocculation at the New Brunswick, N. J., plant. A better effluent, however, could be produced in a shorter time using lime and chlorinated-copperas. The period of flocculation was 4½ hours.

Denver has a 54 m.g.d. chemical precipitation plant

The New 1.50 M.G.D. Buffalo, N. Y., Plant—1938 Provides Primary Treatment and Pre-Chlorination (Greeley and Hansen, Consulting Engineers.)

and Anderson, Indiana, is building a bio-chemical plant of the Guggenheim type. Many small chemical precipitation plants have been installed, particularly in sea coast towns, where the chemical dose is only seasonal. This is especially true where the effluent is discharged into salt water. The trend towards chemical treatment in some form or other is becoming more and more popular because many plants can operate as plain sedimentation units for a large part of the year. Others are being designed as biological plants to be aided by pre-chemical treatment during heavy loading seasons.

Mechanical Filtration

Magnetite filters are being used in increasing numbers and units are now being used on rectangular tanks. Most of the original units were installed in circular tanks. During the year, several mechanically cleaned sand filters (strainers) have been suspended within clarifiers. The sand layer is supported on a brass screen and is cleaned automatically. The principal of cleaning is agitation by means of subsurface water jets and removal of solids by means of a pump connected to the cleaning caisson. Filtered sewage is used for operating the surface jets, the dirty water being returned to the influent of the plant as in the case of magnetite filters. Later these sand filters have been scoured by use of an ejector which lifts about 2 inches of the bottom sand to the top with each washing.

Out of the Ordinary

Some of the novel things reported during this year might be of interest. Some German engineers report using a pure culture of Paramaecium, in the presence of bacteria, to increase the rate of purification in sewage. Jaeger has shown that flocculation of sewage colloidal substances is stimulated by certain pure cultures of unicellular animals.

Beard, in studying the death rate of typhoid organisms in an operating trickling filter reported that with a 6.6 m.g.a.d. rate the typhoid reduction was 99% while at 12 m.g.a.d. it was only 95%. A substantial number of organisms, however, remained at all times.

At Bradford, England, they are trying to convert the grease recovered from sewage into soaps and powders, metallic soap, lubricants, pitch, etc. This information appears in a patent application.

During July and August, a southern city found that the influx of water melon rinds was so great to the municipal incinerator that they found it necessary to save old tires and hard rubber battery boxes for auxiliary heat during that season.

Cedar Rapids, Iowa, sewage plant generates electricity and connects the power generated directly to the bus bars of the local power company. Like Durham, N. C., all power generated may be used and any surplus sold to the power company. This practice has resulted in a large saving to the city.

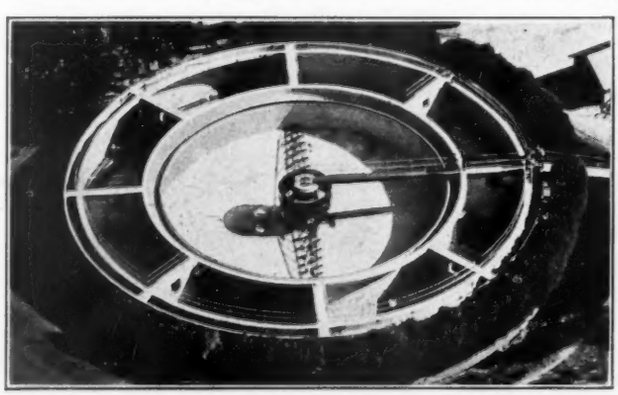
Oneonta, New York, found that the installation of a screenings "Trituator" solved a very troublesome problem of disposal of screenings dependably and economically. Previous to its installation, the screenings were buried. Digestion of triturated screenings has proved advantageous from an operating, sanitary, and economic standpoint.

It has been reported that 1.5 to 2% copper on a dry basis poisons the organisms in sludge and mere traces of copper will vitiate the B.O.D. test.

Kingston, Texas, has found a combination of land irrigation and lake treatment to be the solution for their sewage disposal. The sewage is discharged (400,000 gallons daily) to a lake 12 acres in area and 21 feet deep with an average B.O.D. of 114-173 p.p.m. and is taken from the lake for irrigation with a B.O.D. of 26 p.p.m.. Incidentally, several California cities have found it profitable to sell effluents from sewage disposal plants for irrigation purposes.

Schroepfer presented an analysis of the "Economics of Sewage Treatment" before the American Society of Civil Engineers, which is deserving of the attention of all sanitary engineers. Space will not permit a discussion of that article in this review.

One New York plant has a brown tint to well digested



The Novel, Economical and Compact Currie "Clarnetor." (So successfully employed in activated sludge plants.)

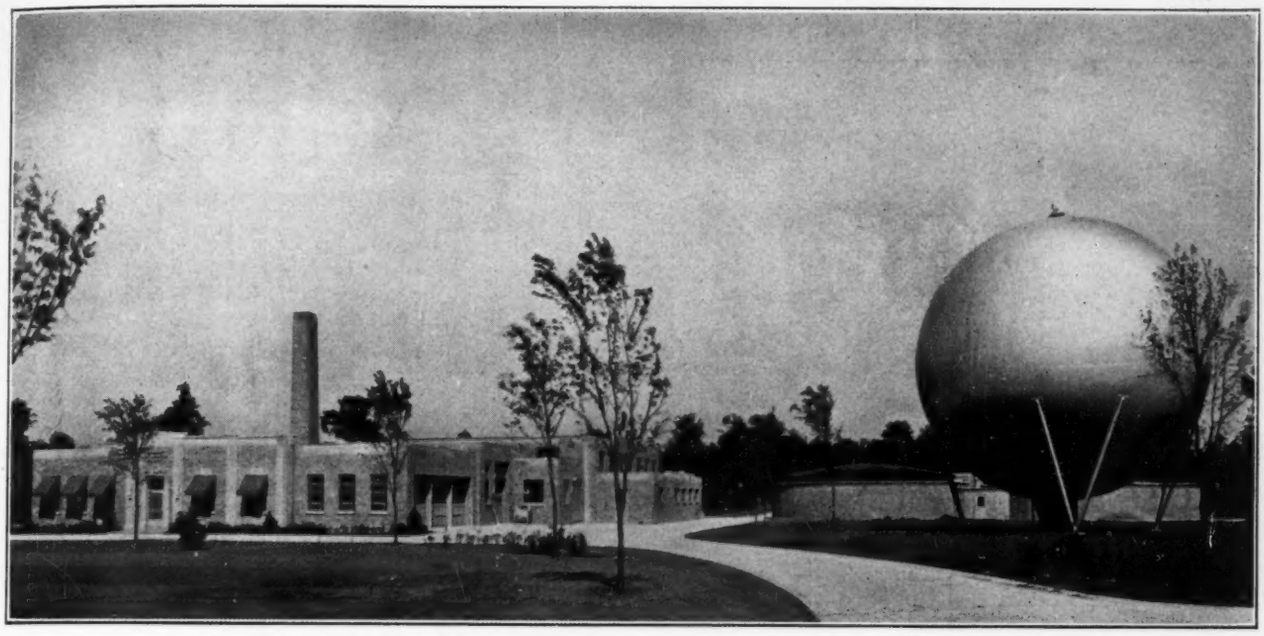
sludge from an Imhoff tank. A strong magnet installed near the influent weir collected an appreciable amount of iron over a 24 hour period. The operator thought it was probably due to the introduction of "Brillo", steel wool and like substances for cleaning of pots and pans in the kitchen.

[More likely grinding and buffering dust from some iron casting plant. The same has previously been noted in connection with an activated sludge plant—functioning in fact as a bio-chemical plant simulating the Guggenheim Process.—Ed.]

digested activated sludge) is compounded and sold for fertilizer. Grand Rapids is still selling all of the digested sludge fertilizer produced. Based upon experimental studies the writer has suggested construction of a ventilated bed, with a shallow depth of sand, for more efficient service with glass covers.

Vacuum Filters Prove Worth

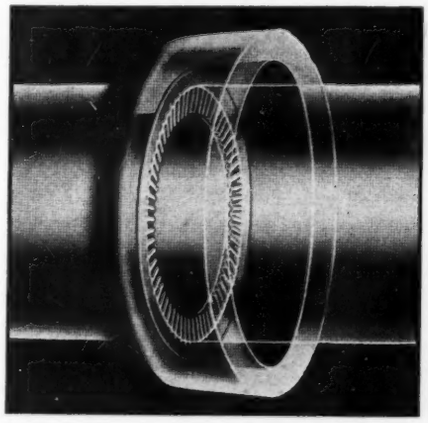
The real highlight in developments in the last few years has been the vacuum filter. It was reported that



The New 25 M.G.D. Plant of Sheboygan, Michigan. Gas from a Multidigestion System is compressed in the gleaming "Bubble of Progress" for subsequent power production. (Jerry Donohue, Consulting Engineer.)

The Problem Child—Sludge

The problem of sludge utilization and disposal has not been given the prominence it deserves, because it is always with us. Milwaukee is again selling its sludge



Copper Rings for Stopping Root Entry. New in '38.

(Milorganite) at a price which is about $8 per ton higher than the low of a few years ago. The sale of fertilizer will help pay the bills this year. One enterprising company, in California, has contracted with a number of communities to purchase the entire output of digested sludge *in situ* on the local sand bids and keep the beds freed for use. The sludge cake (mostly

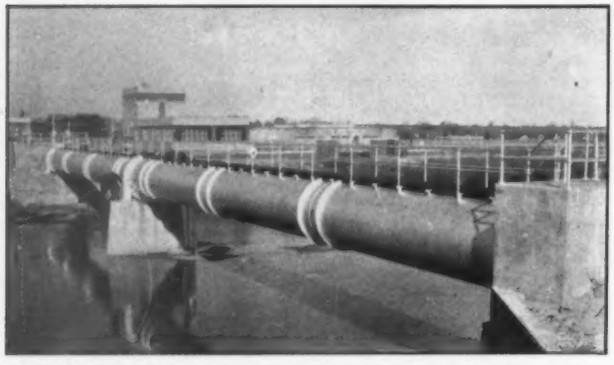
at the beginning of 1938 there were 170 continuous vacuum filters in about 65 cities for sludge dewatering. Installations made in 1937 represent about 60% of the total in use. For the year 1938 it is difficult to get a concise record of the number added, but it should have been a better year than 1937. This development has been definitely linked to the phenomenal progress made in sludge incineration. It is interesting because of the difficulties that have been met in sludge conditioning. One engineer was asked for the name of a plant where they were having trouble with sludge conditioning and his answer was, "Name a plant." Sludge elutriation now being practiced in several plants (notably Washington, Winnipeg, Hartford and Greensboro), has greatly improved sludge conditioning and lowered the quantity of chemicals required in conditioning.

After having to take out the centrifuges at Niagara Falls because they could not live up to the guarantee, the company turned out an improved centrifuge for the Jamaica plant in New York City. On a performance test, using screenings passed through a shredder it showed the power consumption to be 126 K.W.H. per dry ton of cake. The screenings contained 9.25% solids, the centrifugal cake 29%, both on a dry solids basis. The machine delivered 655 pounds of solids (dry basis) per hour. Although conditioning chemicals are not needed with a centrifuge, the process continues to be a batch procedure requiring costly stopping and starting with each charge. The method of concentrating activated sludge in centrifuges at Columbus, Ohio, are entirely different procedure, is continuous and functions on the principle of multiplying gravity as a means of

concentrating suspended solids at the periphery and discharging free water at the center.

Incineration

Incineration of dewatered sludge has come to be a popular method of complete sludge disposal in practically all of the new larger plants, for example, Buffalo, Minneapolis, St. Paul, Detroit, Denver, Cleveland, Columbus, etc. Killiam summarizes the methods of sludge drying and incineration into three methods. (1) Drying for fertilizer, either in a spray type dryer or



More Suspended Sewer Lines in '38. This is River Crossing of Main Trunk Sewer at Denver, Colo.

the common sand bed followed by drying in rotary dryers; (2) Complete incineration, after dewatering on sand beds, vacuum filters or centrifuges; or in flash type dryers; and (3) Complete incineration of screenings.

Installations at various plants vary in size from a single 9 ft. 3 in. diameter unit of 4 hearths to the largest multiple-hearth installation at Detroit where four 22 ft. 3 in. diameter, 12 hearth units are being installed. The Buffalo plant employs flash drying and incineration as does Chicago and Neenah-Menasha, Wisc.

Rudolfs calls attention to one small plant in New Jersey that has 28 separate motors. Another on Long Island, of less than a million gallons capacity, has 27 motors. This is typical of the manner in which many modern motorized plants are designed. In addition to a sanitary engineer, most plants now require a mechanical and electrical engineer for proper operation.

High Rate Filtration

High rate trickling filters, with or without the introduction of induced draft, and the recirculation of part of the effluent have been with us long enough to take stock. The world's largest installation at Dayton, Ohio, will have 10 acres of filter area in 20 units, each 165 feet in diameter. A number of small high-rate plants have been built during the year. Experiences with industrial wastes have shown high rate filtration to be feasible and offers considerable promise in this field.

Studies and developments of Halvorsen's "Aero-filter" have revealed valuable facts concerning the regular trickling filter. Results obtained indicate that ordinary trickling filters can be operated satisfactorily up to 300% of the rate heretofore considered safe standard practice. At the beginning of 1938 reports indicate about 850 trickling filter installations in the United States, the largest being the worthy Baltimore units with a noteworthy record of dependability, efficiency and economy. Worthy of note, also, is the high rate operation of trickling filters made possible by chemical pre-treatment, notably at Atlanta and Hamilton, N. Y., and the basis of design of plants under way at Virginia Beach and elsewhere.

Industrial Wastes

Siebert, of the Pennsylvania Sanitary Water Board, offers comments on industrial pollution which are timely. Over one half the wood going into pulp and paper production is washed into the streams and volume for volume distillery wastes are equivalent to the sewage from ten persons. And dairy wastes are about ten times as strong in pollution load as domestic sewage. Oil refinery, tannery, cannery, mine drainage, packing house wastes all offer problems which are difficult to solve.

A Norwegian (Sveen), has used glue for coagulation of paper mill wastes, resulting in an effluent containing from 12 to 20 p.p.m. total suspended solids as compared to save-alls which had 50-100 p.p.m. in the effluent.

A plant at Phoenix, Arizona, treats a combination of wastes consisting of materials from meat packing, molasses, soap, and liquor distilling plants, plus the sewage of some 300 people. Ferric chloride is manufactured at the plant from waste bailing wire and chlorine. The reclamation of grease, use of gas, sale of sludge, and the use of effluent for irrigation offsets the cost of operation of the plant.

Hiram Walker & Sons report that they have in operation a complete slop recovery plant handling distillery wastes, and that it is being operated at a profit to the company. The process essentially consists of fine screening and pressing to a solid content of about 30%. The effluent is sent through a centrifuge and then to evaporators which raises the 20% solids in the centrifuge to 45-50% solids. The thin liquid from the centrifuges, containing valuable colloidal and soluble solids, is pumped directly to multiple effect evaporators. A mini-

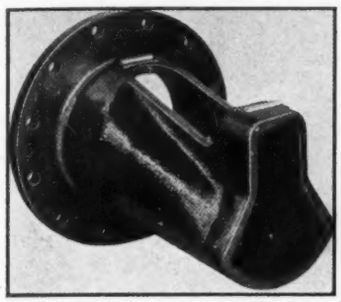
More Asbestos-Cement Pipe used in Sewer Construction in '38 with Poured Bottle-tight Joints.

mum of two pounds of evaporation is obtained per pound of original steam used. The company will soon put into operation a solvent extraction plant that will extract corn oil from these distiller's grains.

The Dow Chemical Company reports successful operation of a phenolic waste treatment plant which consists of preliminary settling and pH adjustment, followed by trickling filters. The system removed over

99% of the phenols from plant waste liquors during the later part of 1938.

Dairy wastes still remain a universal problem, because of its universal distribution. Experimental work with high-rate tin can trickling filters yielded very good effluents. Excellent efficiencies resulted with three filters in series at a 5 m.g.a.d. rate and 8 cu. ft. of media per lb. B.O.D. removed per day. Trebler, of Sealtest, Inc., reports favorably also on the rapid flow tile filters of the Halvorson type, but finds the tile bed more expensive than his tin can tricklers. He also reports that the Guggenheim process of waste disposal is being employed for treating dairy wastes at a reasonable cost.



The Kennison Sludge Measuring Nozzle—New in 1938.

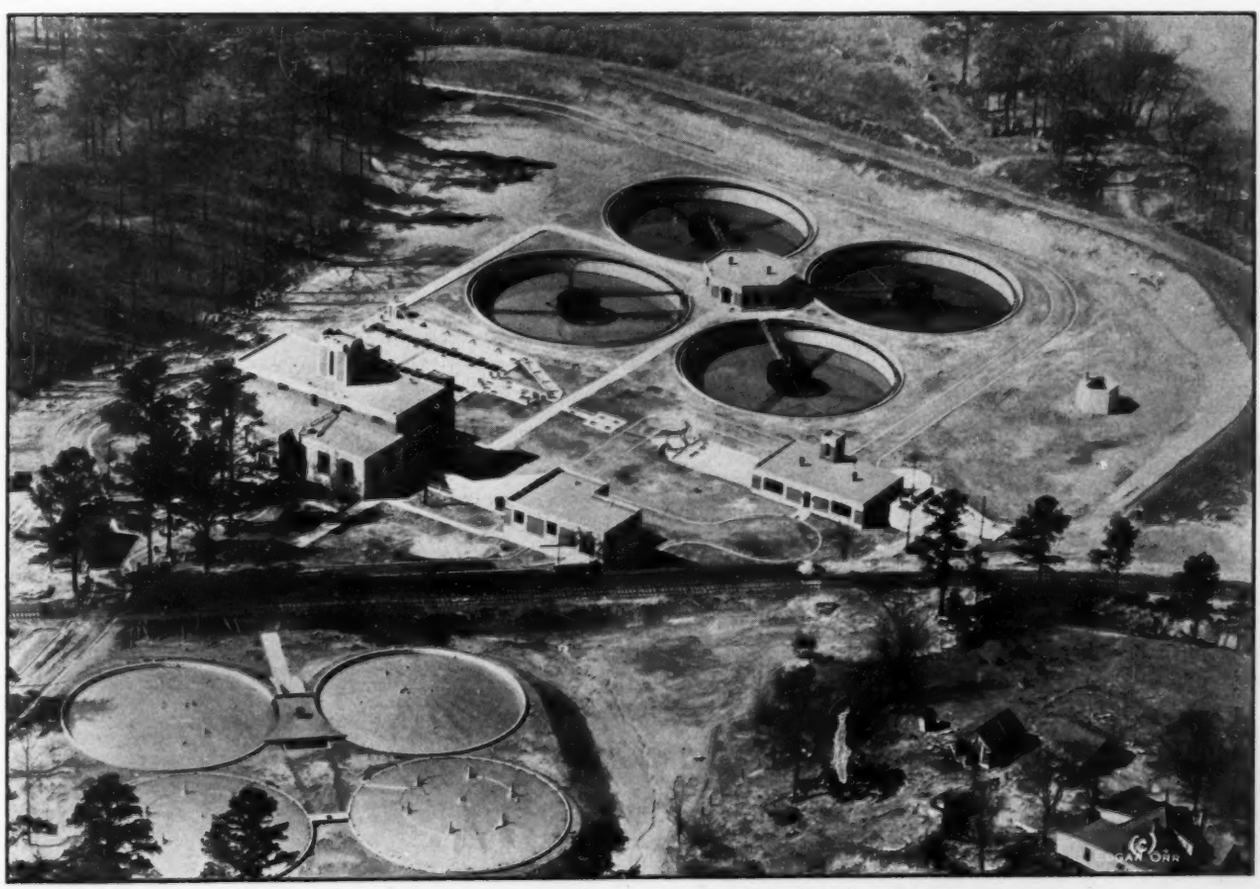
Trickling filters still constitute the unit in common use today for treatment of milk wastes. In this the high rate trickling filters, with return of effluent, has proved quite successful.

The Textile Foundation in its commendable work on the treatment of dye wastes reports on the treatment of sulfur dye waste mixed with domestic sewage, finding that mixtures of this waste and sewage can be treated by the activated sludge process, provided that not more than three per cent of the concentrated dye waste is present in the sanitary sewage.

A plant at Muncie, Ind., for disposal of packinghouse waste is of the general activated sludge type, with several unique features which include preaeration of the incoming wastes, intermittent intensity of aeration in the main aeration units, split flow of return sludge, and intermixing of waste sludge in the pre-aeration tank and primary clarifier. At times the B.O.D. of the waste was 2,000 p.p.m. The cost of treatment was 5.5 cents per hog unit.

In an editorial in Sewage Works Journal, captioned "Are Industrial Wastes Liabilities?", attention is called to three large companies in the Chicago district, using grain for raw material, that have solved their problems of waste disposal so that the byproducts pay the cost. At the Hormel plant in Austin, Minn., experiments on packinghouse wastes produced a sludge that proved toxic as a stock feed, and too greasy for a fertilizer. Commissions are formed to study industrial waste problems and attack the problem vigorously, but it seems that after a few years interest lags. Industrial waste is an increasing problem.

The writer has been at a serious disadvantage trying to condense material which seems important enough to occupy the space reserved for this review. So many new plants, so much new material, and so much of interest has developed in recent months that the writer found himself at a loss in deciding just what to include. It is believed that this represents a good state of affairs, because it denotes genuine PROGRESS.



Atlanta's New Chemical Precipitation Plant (Wiedeman & Singleton Cons. Engrs.)

THE STABILIZATION OF LIME-SOFTENED WATER

A Comparison of Three Methods, and Practical Methods of Testing

By H. O. HARTUNG, Chemist
St. Louis County Water Co.
University City, Missouri

A LIME softened water is usually highly incrustant unless given further treatment to produce non-incrusting properties. The incrusting substance is calcium carbonate produced in softening reactions which, although present in quantities above normal solubility, did not precipitate in the settling basins. Incrustation occurs whenever such water, in striking the sand grains of a filter or the walls of transmission mains or pipe fittings, unloads some or all of its calcium carbonate in excess of its normal solubility. Such waters are said to be super-saturated in respect to calcium carbonate content.

Obviously the most desirable way to produce a non-incrusting water is to hold the water in the softening plant until complete precipitation of all supersaturated salts has been effected. In addition, this gives the maximum hardness reduction. The use of such equipment as the Spaulding "Precipitator" and the "Acellator" for the recirculation of softening sludge is an attempt to produce water in which the softening reaction has been carried to completion. But usually it is not possible to accomplish such results in existing plants.

Carbonate Adjustment

When it is not possible to completely precipitate the products of the softening reaction, equilibrium must be restored by additional treatment. If it is not restored, incrustation of the filter sand and scaling of the distribution system is the result. The commonly accepted method by which stabilization has been obtained is to convert the supersaturated calcium carbonate, with an acid or acid salt, into a more highly soluble salt of calcium. When carbon dioxide (recarbonation) is used, the supersaturated calcium carbonate is converted into non-precipitating calcium bicarbonate. When alum is used, considerable of the surplus calcium carbonate is converted into a more soluble calcium sulphate. Phosphoric acid, sulphuric acid and nitre cake have also been used in a few instances to convert supersaturated calcium carbonate in the water. The addition of any of these substances to the water to produce equilibrium is accompanied by a lowering of its pH value.

The Author

A New Method

Recently another method of preventing calcium carbonate precipitation has been announced and is attracting considerable interest. (See Hoover and Rice, January issue of this magazine.) The method has been reported successful in several industrial water treatment plants and at one or two municipal water plants. It is simply accomplished by adding one or two parts per million of sodium hexametaphosphate $(NaPO_3)_x$ to the water prior to, or following, filtration. This small amount of sodium hexametaphosphate, necessary to produce stabilization, is not dependent upon the alkalinity or pH of the water to be treated, and does not change the pH of the treated water. Also, the amount necessary for stabilization is only a small fraction of that required to react quantitatively with the calcium in solution. The sodium hexametaphosphate merely inhibits calcium carbonate incrustation. Certain surface-active properties of the molecule of this salt (phosphate glass) apparently explains the phenomena.

The object of this paper is to very briefly compare these two methods of stabilization as applied to lime softened water at the St. Louis County Water Company.

TABLE 1

Recarbonation Plant Report—St. Louis County Water Company

		1936	1937	9 Months, 1938	Av. or Total
Phenolphthalein Alkalinity	Before Recarb.	30	29	26	29
	After Recarb.	9	5	11	9
pH	Before Recarb.	10.3	10.4	10.1	10.2
	After Recarb.	8.9	8.7	9.2	8.9
Hours Operation		6,387	5,727	5,769	30,464
Water Used in Plant (1000 Gal.)	Boiler	738	697	319	...
	Scrubber	7.708	6,572	6,489	...
	Compressor	303	103	128	...
Fuel Oil Burned (Gallons)	Total	54,083	49,242	32,378	233,140
	Per M.G.	11.7	12.7	9.0	11.3
P.P.M CO_2 to HCO_3 per Gal. Oil per M.G. Water (p.p.m. $CaCO_3$)		3.53	3.78	3.55	3.61
Estimated Lbs. CO_2 Utilized Per Gal. Oil Burned		13.0	13.9	13.0	13.2
Overall Chemical Efficiency of Plant (per cent)*		56.6	59.5	55.3	56.6
% Carbon Dioxide in Scrubbed Gas		10.6	10.9	6.0	9.0

*Chem. Eff. $= \frac{2(P'-P'')}{6.36(\text{Gal. Oil Per M.G.})}$

P′=Phenol. Alk. before recarb.—P″=Phenol. Alk. after recarb.

TABLE 2

Sodium Hexametaphosphate Tests on Lime Softened Water

Initial Water pH	Initial Water Total Alkalinity ppm.	Initial Water after 24 hrs. Contact with $CACO_3$ — Total Alkalinity ppm.	Initial Water Plus Sodium Hexametaphosphate after 24 hrs. Contact with Calcium Carbonate $(NaPO_3)_x$ Dose ppm.	Total Alkalinity ppm.	No. of Daily Tests Making Average
10.5	49	25	2	46	2
10.2	46	25	2	46	7
9.8	50	33	2	49	5
10.1	41	23	1	41	3
9.9	54	28	1	52	6
10.8	61	33	0.5	60	1
10.5	55	24	0.5	55	1
10.1	46	25	0.5	45	16
9.9	47	29	0.5	46	9

Experiences with the Old and the New Methods

Stabilization of lime softened water at the St. Louis County Water Company filter plant is accomplished, at the present time, by recarbonation. The stack gases from an oil fired furnace are scrubbed, dried and then pumped by a reciprocating compressor into the water. Regulation is obtained by metering and controlling the amount of oil burned. Thus the amount of fuel oil burned each hour depends upon the demand of the water for carbon dioxide and the amount of water pumped during that hour. [Figure 1 is a schematic sketch of the recarbonation plant.]

The plant is sufficiently large to recarbonate about 30 m.g.d. of water, depending, of course, upon the water requirements of carbon dioxide. The oil burners can be varied to burn from 3 to 12 gallons of fuel oil per hour. The amount to be burned is specified by the laboratory. All of the gases from the furnace are drawn into a water spray contact scrubber by the suction created at the compressor. The scrubber is 60 inches in diameter and 13 feet high. The gases rise vertically through 4½ feet of 2-inch gravel and then through 4½ feet of packed excelsior, which is kept wet by overhead water sprays. These sprays use about 1,000 gallons of water per hour. The gases deposit most of the unburned material which they carry on the wet surfaces in the scrubber. From the scrubber the gases pass to a drier, 20 inches in diameter and 15½ feet high, filled with iron scrap and turnings. The fuel oil contains a small percentage of sulphur and the acids formed by this sulphur are expended upon the exposed iron surfaces in this tower. The gases next pass to an adjacent drier of the same dimensions, but filled with mineral wool and packed excelsior. These materials mechanically entrain much of the remaining moisture, thus protecting the compressor against corrosion to a considerable extent. The compressor then pumps the gases to the water being treated. Stainless steel valves have also minimized corrosion and maintenance of the carbonating equipment.

The operating data obtained during the last 2 years and 9 months' operation of the recarbonation plant are given in Table 1.

Poor Carbonating Efficiencies

The average chemical efficiency of the plant has varied between approximately 55 and 60 per cent. The chemical efficiency of the plant is the ratio of the carbon dioxide utilized to that *potentially* available in the fuel oil burned. It thus takes into consideration combustion, scrubbing, absorption and grid losses. The greater part of the 40 per cent losses are encountered in the grid system. Much of the carbon dioxide bubbles through the water and escapes to atmosphere. About 10 per cent of the carbon dioxide is lost in the scrubber. Taking into consideration these losses, only about 13 pounds of carbon dioxide from every gallon of fuel oil burned is actually utilized in the process.

The gases from the fuel oil combustion have averaged about 9 per cent carbon dioxide. This percentage should not be confused with the per cent carbon dioxide obtained in a

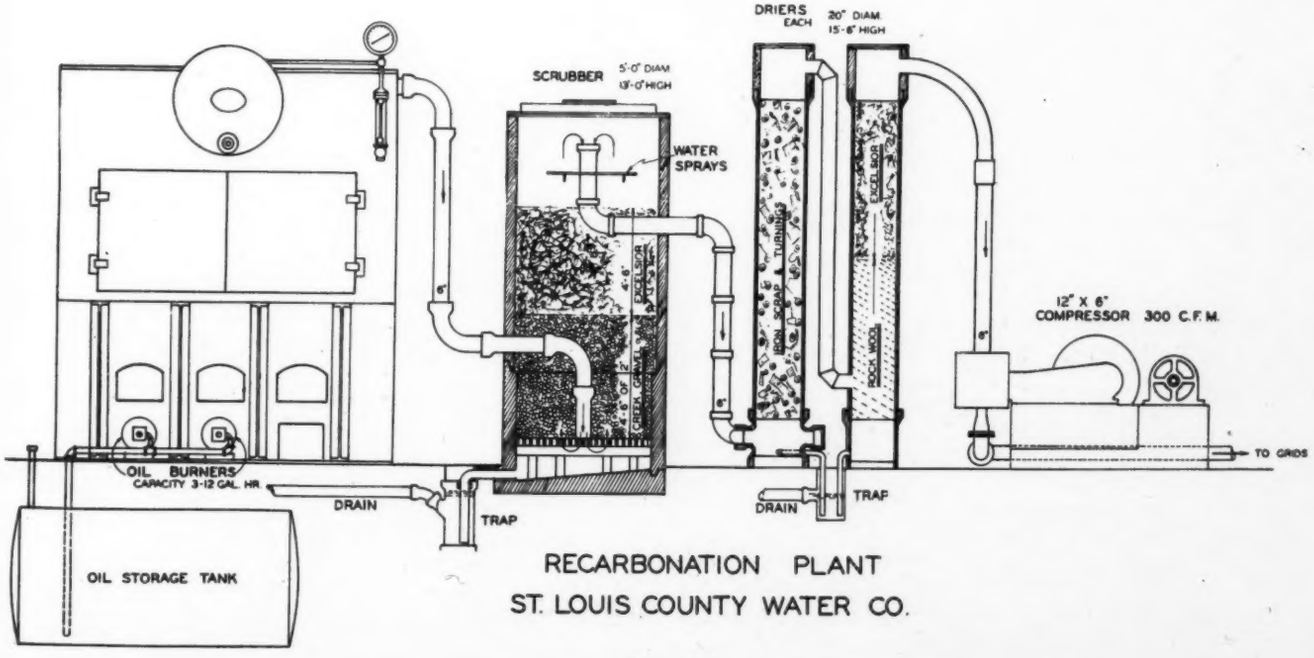


Fig. 1

Flow Diagram and Sketch of the Recarbonation Facilities—St. Louis County Water Co.

TABLE 3

Effect of Temperature on Lime Softened Water Stabilized with One P.P.M. Sodium Hexametaphosphate

Temperature F°	Original Water pH	Original Water Total Alkalinity	Total Alkalinity After Stability Test Sodium Hexametaphosphate Treated Water	Total Alkalinity After Stability Test Untreated Water	Time Contact with $CaCO_3$ at Temperature Indicated -Hours-	Number of Determinations Different Days
40	10.4	54	53	35	6	3
55	10.4	54	54	34	6	3
75	10.1	42	42	26	6	10
100	10.1	42	42	30	6	10
140	10.1	42	41	31	6	10
180	10.1	42	41	34	6	10
212	10.1	42	38	31	2	10
250	10.1	42	31	29	½	10

regular fuel oil furnace. In the recarbonation plant the draft on the furnace is kept constant by the suction from the compressor. The fuel oil burned, however, is varied to meet the recarbonation demands of the water. The percent carbon dioxide thus varies with the amount of fuel burned.

The average of 3.6 parts per million of carbonates converted to bicarbonates, per gallon of oil burned for each million gallons of water treated (see Table 1), is a convenient unit figure for specifying the correct oil feed. For example, if the normal carbonates in the water equal 46 p.p.m. before recarbonation and are to equal 10 p.p.m. after recarbonation (i.e., the reduction in normal carbonates is to equal 36 p.p.m.), the oil to be burned per million gallons must equal 36 divided by 3.6, or 10 gallons. The unit figure is an average obtained from actual plant operating data.

Laboratory Control Procedure

As has already been mentioned, the amount of fuel oil to be burned is specified by the control laboratory. The laboratory arrives at the correct result from daily calcium carbonate stability tests. About 50 grams of calcium carbonate are added to 500 ml. of water treated with carbon dioxide and then rolled for eight hours on the rolling machine, pictured in Figure 2. The water is then centrifuged and an alkalinity determination made. A drop in alkalinity or pH after rolling is indicative of an incrustant water. Similarly, an increase in alkalinity or pH after rolling is indicative of overtreatment with carbon dioxide. The plant carbon dioxide dose is adjusted accordingly.

Figure 3 illustrates a convenient method for determining the pH at which a carbon dioxide treated water is stable. Several samples of lime softened water are treated with various amounts of carbon dioxide. This is done by saturating a sample of the same water with carbon dioxide. Then, with a pipette, various quantities of the carbonic acid solution thus formed are applied to the water under test. Next the pH of each sample is carefully measured and recorded. After adding calcium carbonate, the samples are rolled for about eight hours, entrifuged and the change in alkalinity noted. By plotting the change in alkalinity against the pH of the water before the addition of calcium carbonate, the pH at which there is no change in alkalinity can be read. This is the stability pH which should be obtained in the plant.

Hexametaphosphate Treatment for Stability

Calcium carbonate precipitation may also be prevented by the addition of 1 to 2 p.p.m. sodium hexametaphosphate $(Na\ PO_3)_x$. This effect is produced regardless of the amount of calcium in the water[1] and without a change in pH. In hot water systems somewhat larger dosages have been reported to effectively disintegrate old scale deposits.

The effectiveness of 1 or 2 p.p.m. of sodium hexametaphosphate in preventing calcium carbonate precipitation may be conveniently demonstrated in the following experiment. To 500 ml. of water containing from 50 to 150 p.p.m. calcium bicarbonate add 2 p.p.m. of sodium hexametaphosphate and 250 p.p.m. of soda ash. To a duplicate sample add 250 p.p.m. of soda ash.

Precipitation in the second sample will usually occur within five minutes, while in the sample containing the hexametaphosphate the reaction will be delayed many hours to several days.[2]

Table 2 gives the results of calcium carbonate stability tests on lime softened water, taken from the basins of the St. Louis County Water Company, with and without treatment with sodium hexametaphosphate. This table shows that high pH waters were stable after 24 hours when treated with as little as 0.5 p.p.m. of sodium hexametaphosphate, as determined by the changes in alkalinities. Samples treated with sodium hexametaphosphate had very little, if any, change in alkalinity after contact with calcium carbonate.

Each day, for a period of about two months, two 250 ml. water samples were taken from the softening basins. Sodium hexametaphosphate was added to one sample in the amounts indicated in the table. One gram of pulverant calcium carbonate was then added to both samples. The water samples completely filled the sample bottles, which were tightly stoppered. Both sample bottles were then rolled for eight hours in the machine (Fig. 2), and the change in alkalinity (if any) determined after 24 hours. The same calcium carbonate was used in each succeeding day's test. Table 2 reveals the average of these determinations.

Sodium hexametaphosphate will revert to the orthophosphate form upon prolonged heating and thus lose its surface-active properties. (Trisodium phoshate is an ortho phosphate.) Table 3 gives the stabilization effect of sodium hexametaphos-

TABLE 4

Effect of Sodium Hexametaphosphate Added to Water Already Stabilized by Recarbonation

Temp. F°	Water Stabilized by Recarbonation at Room Temperature Alkalinity P	Alkalinity M.O.	pH	Chemical Characteristics After Stability Tests Recarbonated Water—Untreated Alkalinity P	Alkalinity M.O.	pH	Recarbonated Water Treated with Hexametaphosphate Alkalinity P	Alkalinity M.O.	pH
212	2	34	8.4	7	35	9.0	8	35	9.0
250	2	34	8.4	11	34	9.2	10	35	9.2

(Results given are the average of five determinations made on different days.)

[1] "Threshold Treatment" by Chas. P. Hoover, Chemical Engr., Columbus, Ohio, and Owen Rice, Hall Laboratories, Pittsburgh, Pa., in Water Works and Sewerage, January, 1939.

[2] Suggested by Hall Laboratories, Pittsburgh, Pa., and confirmed by author.

phate on lime softened waters heated to temperatures encountered in the ordinary domestic hot water system. According to these laboratory results, one p.p.m. of sodium hexametaphosphate effectively stabilizes the water up to about 200° F. However, at boiling temperatures it is not so effective. But even at these temperatures as little as one p.p.m. of hexametaphosphate has some effect in pegging the alkalinity. At 250° F. the stabilizing effect of such a low dosage of sodium hexametaphosphate is negligible from a practical point of view.

The stability tests for water heated up to 200° F. were made as before but in vacuum ("Thermos") bottles. About 0.5 gram of calcium carbonate was added to 500 ml. of water heated to the proper temperature and placed in vacuum bottles, and then rolled for 6 hours on the rolling machine. After 6 hours the water was cooled, centrifuged and alkalinity again determined. Fresh calcium carbonate was used in each test.

Tests at 212° F. were made by almost completely submerging the test bottles fitted with loose stoppers in a water bath for two hours. The tests at 250° F. were made in a steam autoclave for 30 minutes. The alkalinities reported for these two temperatures were adjusted to compensate for volume changes resulting from heating and cooling.

Water which is stabilized by recarbonation at room temperature often loses its stable characteristics at higher temperatures. Table 4 shows that seemingly nothing is gained by adding sodium hexametaphosphate to water which has been recarbonated to stability and then heated to boiling temperatures. That is, sodium hexametaphosphate did not prevent calcium bicarbonate in carbonated water from breaking down into calcium carbonate, such as occurs in hot water systems.

TABLE 5

Tetra Sodium Pyrophosphate Stability Tests on Lime Softened Water

Original Water			$Na_4P_2O_7$	Total Alkalinity After Stability Tests	
Alkalinity		pH	Dose	24 Hrs. @	2 Hrs. @
P	M.Or.		p.p.m.	75° F	212° F
23	46	10.1	0	26	33
..	..	..	0.5	46	42
..	..	..	1.0	46	41
..	..	..	2.0	48	42

(The above results are an average of 5 determinations made on different days.)

Hexametaphosphate vs. Recarbonation

Sodium hexametaphosphate may be easily fed as a solution. Since it is non-corrosive, any type of solution feeder may be used. A simple siphon feeder from a barrel or drum is satisfactory.

Sodium hexametaphosphate is an effective stabilization agent in concentrations from about 0.5 to 10 p.p.m. Consequently, close regulation of feed is not necessary. Periodic check on the feeder is all that would be required.

About 0.75 p.p.m. sodium hexametaphosphate, at present prices, is approximately equivalent in cost to recarbonation at St. Louis County Water Company. This, however, will vary at different plants. However, there are other considerations. Sodium hexametaphosphate treatment seems to have an advantage over recarbonation in that stability is much easier to obtain, and the simpler equipment requires less investment, less space, and is much less costly to maintain.

The recarbonation plant at the St. Louis County Water Company requires a monthly maintenance program which necessitates the plant to be out of service for at least one day while the compressor is being cleaned or the materials in the drier are being changed. No such out of service period, or labor and materials cost, would be necessary for the sodium hexametaphosphate feed because duplicate feeders may be installed at small cost.

Another advantage seems to be that application of sodium hexametaphosphate enables coagulation at any pH. Unfortunately the pH at which water is ordinarily considered stable is not the pH of optimum coagulation with either aluminum sulphate or any of the iron salts. This is a tremendous handicap in plants where coagulation immediately prior to filtration is necessary. Sodium hexametaphosphate stabilization allows coagulation at the optimum pH in softening and still prevents sand incrustation and after precipitation.

Stabilization with Tetra-Sodium Pyrophosphate

In order to determine whether certain other phosphate salts might have surface-active properties similar to those of sodium hexametaphosphate, some of the previous stability tests were repeated, using tetra-sodium pyrophosphate instead of sodium hexametaphosphate. Table 5 shows that as little as 0.05 p.p.m. of tetra sodium pyrophosphate was also effective in stabilizing the water at room temperature for at least 24 hours. At 212° F. tetra-sodium pyrophosphate was less effective in preventing incrustation than at room temperature. With a treatment of 2 p.p.m. there was some calcium carbonate deposition within 2 hours at the boiling temperature.

Table 6 shows that 1 p.p.m. of tetra-sodium pyrophosphate was an effective stabilization agent until the water approached boiling temperature. At 250° F. the tetra-sodium pyrophosphate had very little effect in holding the alkalinity at its original value. All of these results may be compared with

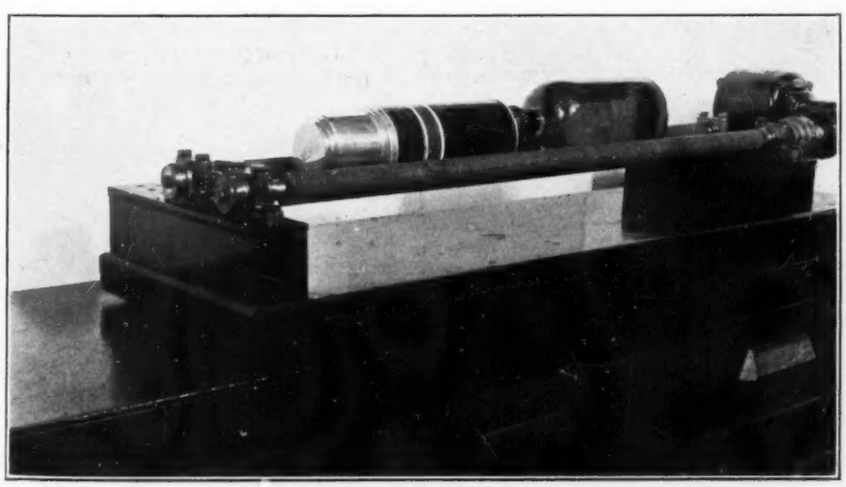


Fig. 2

The Rolling Machine for making the Routine Marble Test. Eight hours required to attain equilibrium with the St. Louis County water.

TABLE 6

Effect of Temperature on Lime Softened Water Stabilized with One P.P.M Tetra Sodium Pyrophosphate

Temperature F°	Original Water pH	Original Water Total Alkalinity	Total Alkalinity After Stability Test $Na_4P_2O_7$ Treated Water	Total Alkalinity After Stability Test Untreated Water	Time Contact with $CaCO_3$ at Temperature Indicated -Hours-
40	10.4	54	53	35	6
55	10.4	54	54	34	6
75	10.0	44	46	28	6
100	10.0	44	47	29	6
140	10.0	44	44	32	6
180	10.0	44	43	37	6
212	10.0	44	41	33	2
250	10.0	44	35	30	½

(The above results are an average of 3 determinations made on different days.)

results obtained when stabilization was obtained with sodium hexametaphosphate (see Table 3) and there appears little if anything to choose between the two salts.

Qualitative tests made in the laboratory, however, seem to indicate that water with high calcium concentrations are not so easily (if at all) stabilized with tetra-sodium pyrophosphate. This seems to be at least one differentiating characteristic between sodium hexametaphosphate and tetra-sodium pyrophosphate for stabilization.

Conclusions

The present accepted and proven method for transforming a lime softened water into a stable water is by recarbonation. However, new methods are constantly being developed which merit the attention and study of the water works operator. Sodium hexametaphosphate "Threshold Treatment" seems to be one of these. The cooperative study of the water works profession will prove whether it is universally adaptable in public water supply treatment. Other phosphate salts, such as sodium pyrophosphate, may also accomplish the same results and suggests further research.

Acknowledgment—This paper was read before the Missouri Conference on Water and Sewage and is published with the permission of the Conference.

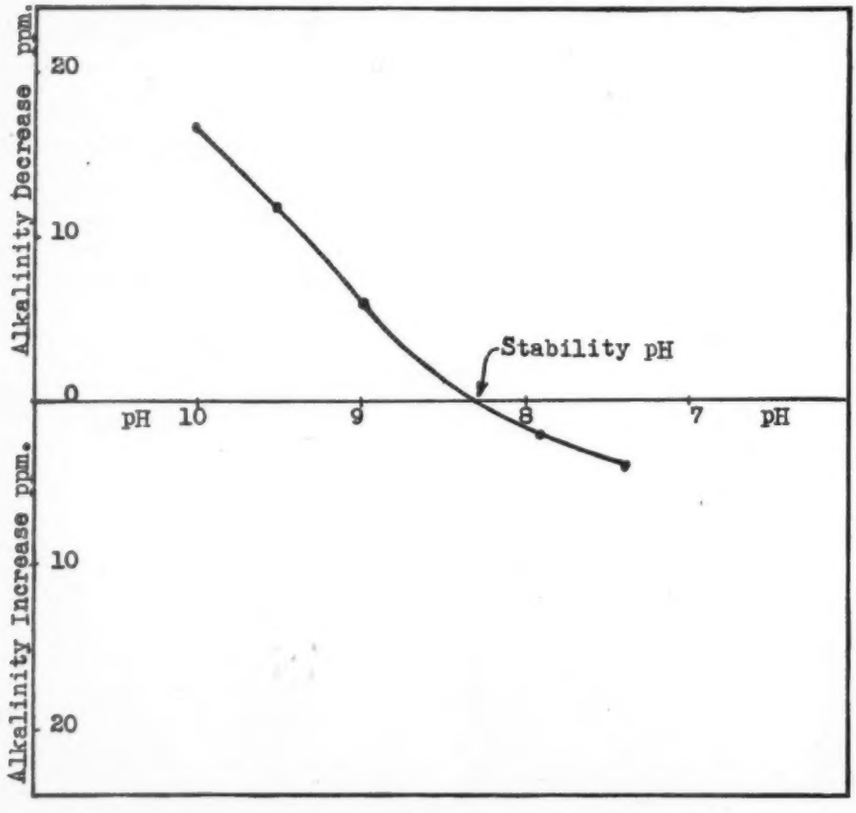
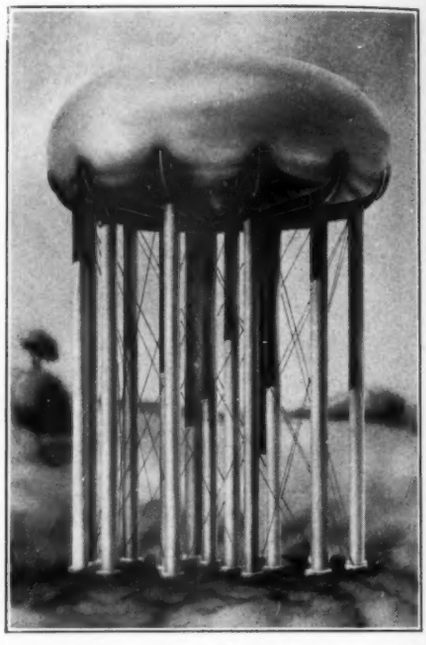


Fig. 3
Graph for Determining Calcium Carbonate Stability pH. (Missouri River Lime Softened Water—Oct., 1938.)

Indianapolis Water Co. Adds Another 1.5 M.G. Elevated Tank

The Indianapolis Water Company is installing its second large capacity elevated tank. The first one, like the present tank, has a capacity of 1,500,000 gals. and is 72 ft. to bottom. Of radial-cone design it has a range in head of only 25 ft. between the upper and lower water levels.

The new tank, now under construction, and therefore here pictured from the artist's drawing, is also of radial-cone design. The tower posts are of new tubular construction, however, in contrast to the structural columns used on the first tank.



Indianapolis Modern 1.5 M.G. Water Tank

Amongst other novel construction features it is noted that there is no balcony whatsoever, the tank being spheroidal in line throughout. Also, the radial girders follow the curve of the bottom towards the shell and end just short of the place where the tank shell becomes vertical. There is no visible ladder and welded construction is being used throughout.

Instead of one large riser tube at the center of the structure, the Indianapolis tank will have four tubular posts arranged in a cluster. One of these posts will serve as a riser, while the second will contain a ladder, providing access to the inside of the tank. The other two will serve as supporting members only.

The new tank will be 92 ft. high (to bottom) and has a range in head of 30 ft. between the upper and lower water levels.

A.W.W.A. DIRECTORS' CHOICE

J. Arthur Jensen

For President
J. ARTHUR JENSEN

For Vice-President
NORMAN J. HOWARD

Norman J. Howard

Hal F. Smith Voted Diven Medal;
David G. Thompson and Albert G. Fiedler the Goodell Prize

ON January 18th, Directors of the American Water Works Association met in New York City to represent their several Sections in choosing officers for the year 1939-1940; approving committee selections of the John M. Diven Medalist, and winners of the John M. Goodell Prize; hearing reports of officers and committee chairmen; examining and approving the budget; drawing resolutions; and attending to other business of the Association.

Officers Chosen:

The Board, meeting first as the Nominating Committee, chose the following as the official nominees for 1939-1940 offices. Such choice is tantamount to election, and taking of office at the close of the Annual Convention in June.

For President—J. ARTHUR JENSEN, Supervisor Water Department, Minneapolis, Minn.

For Vice-Pres.—NORMAN J. HOWARD, Superintendent of Water Purification, Toronto, Canada.

WM. W. BRUSH was named to serve his fourteenth term as treasurer of the Association and Secretary HARRY JORDAN was routinely re-elected, with a vote of high commendation for his accomplishments in the office of the Executive Secretary, and with expressions of appreciation. In recognition of the strides being made by the Association and its markedly bettered financial status since Mr. Jordan took over the management of Association affairs, as is customary with other productive "business managers," the Secretary's salary was boosted in the neighborhood of 10 per cent.

Hal. F. Smith

A. G. Fieldler

Honorary Members

Five names for Honorary Membership were presented by the Committee on Honorary Membership, with citations. The Board unanimously approved the nominations, and declared as Honorary Members the following:

MR. FRANK A. BARBOUR, Consulting Engineer of Boston, Massachusetts, a member of the A.W.W.A. since 1906, its President in 1936, conspicuous for his keen discernment of engineering values, unflagging in his leadership in the affairs of water works men.

MR. CARLETON E. DAVIS, Manager of the Philadelphia Suburban Water Company at Bryn Mawr, Pennsylvania, a member of the A.W.W.A. since 1912, its President in 1920, nationally recognized as an able administrator in the field of public water supply, whose earlier services to the Association contributed materially to its present standing.

MR. CHARLES GILMAN HYDE, Professor of Sanitary Engineering in the University of California at Berkeley, California, a member of the A.W.W.A. since 1907, presently chairman of the Water Purification Division, a leader and teacher of men whose influence is nation-wide.

MR. HARRY E. JORDAN, Secretary of the Association since 1936, resident in New York, a member of the A.W.W.A. since 1919, Secretary of the Water Purification Division from 1923 to 1935, President of the Association in 1935, Diven medalist in 1936.

MR. BEEKMAN C. LITTLE, Secretary Emeritus of the Association, resident in Rochester, New York, a member of the A.W.W.A. since 1903, its President in 1921, its Secretary from 1926 to 1936, a genial leader of men whose organizing ability contributed materially to the present standing of this organization.

Diven Medal and Goodell Prize

The Diven Medal "for an outstanding service to the Association during the year" was voted:

MR. HAL F. SMITH, of the Department of Water Supply of Detroit, Michigan, for his leadership of members of this Association, stimulating them to the fine cooperative activity which made possible the preparation of the Manual of Water Works Accounting in its present commendable and useful form. Such leadership being deserving of recognition from the Association."

The John M. Goodell Prize for 1939 Was Voted:

MESSRS. DAVID G. THOMPSON and ALBERT G. FIEDLER, engineers with the U. S. Geological Survey, "for their paper entitled 'Some Problems Relating to Legal Control

of Use of Ground Water,' presented at the New Orleans convention and published in the Journal for July, 1938. The paper is thus selected because it combines wide research and interpretive scholarship in the presentation of a study of great importance to public water supply practice."

Resolutions Adopted

The Board adopted two resolutions of considerable importance to water works men. One relates to retroactive taxation of the income of state and municipal employees. The other relates to the proposal to levy federal taxes upon the interest of state and municipal securities.

The proposed legislation is now before a special committee of Congress headed by Senator Prentiss Brown of Michigan. If you personally support the resolutions it is of importance that you send copies to your Senator and Congressman and urge that each support the procedure outlined by the resolutions.

1. WHEREAS, Recent judicial decisions relative to the liability of employees of the states and their civil sub-divisions for federal taxation of their income have been interpreted to authorize the Internal Revenue Department to enforce a collection of such taxes not alone for the 1938 period, but also retroactively for the entire period of years for which there may be legal liability under existing laws as now interpreted,
   WHEREAS, Many of the members of the American Water Works Association, who are employees of states or their political sub-divisions, have been led by the tenor of previous judicial decisions to consider themselves not liable for federal income tax, and in good faith have so acted, and
   WHEREAS, It has been reported that, in a very recent press conference, the President of the United States has indicated that he would recommend that legislation be enacted to remove the possibility of retroactive taxation of such persons; therefore be it
   Resolved, by the Board of Directors of the American Water Works Association in annual meeting assembled in New York on January 18, 1939, That it approve and heartily support the recommendathat the Congress enact such legislation as will relieve state and municipal employees from the possibility of retroactive federal income taxation.
2. WHEREAS, The Federal Department of Justice has advised the Treasury Department, "that the principle of immunity protected the federal government against taxation by the states, but did not necessarily shield the states against the exercise of the delegated and supreme taxing power of the central government," and
   WHEREAS, The enforcement of this opinion would affect the states and their political sub-divisions by taxation of the interest paid on their bonds and other certificates of indebtedness, and
   WHEREAS, The financial situation of the water supply systems that are under the control of municipalities or other political sub-divisions of the state would be vitally affected by the federal government's taxing the interest upon the securities of such systems, and
   WHEREAS, It would manifestly be unfair to the present owners of municipal water bonds to be taxed on the income derived from such bonds, when the bonds were sold on the basis that such income was legally tax exempt; therefore be it
   Resolved by the Board of Directors of the American Water Works Association at the annual meeting assembled in New York on January 18, 1939, That it oppose any federal taxation of already issued water supply or other securities of the states, their sub-divisions and agencies; and that the right of the federal government to tax future issues of securities of the states, their sub-divisions and agencies, should only be granted if the consent of the states is first secured through the adoption of a constitutional amendment that would guarantee the reciprocal right of each state to tax future issues of federal securities as they may be held within the various states.

Stand on National Water Policy Re-stated

The Board adopted a new statement pertaining to a national water policy, as recommended by Abel Wolman of the Association's committee on that subject. The important paragraphs of this report are as follows:

(1) No further extension of basic federal control over streams is desirable at this time.

(2) The federal government should restrict its activities in pollution abatement, to fact finding on, *coordination and stimulation* of, and financial assistance to state and inter-state programs, so as to promote the solution of such problems consistent with other important national requirements.

(3) The initiation, administration and financing of projects largely of non-federal character should be reserved for state and inter-state action.

Inasmuch as legislation on the subject of stream pollution will with some certainty come before the present session of Congress, this statement of policy on behalf of the A.W.W.A. is timely.

(It is to be noted that the wording and intended meaning of the new statement is more specific than in earlier statements by A.W.W.A. The italics above are ours.—Ed.)

Concerning Grounding Practices

Following a special meeting of the Research Committee on Electrical Grounding, a report was made to the Board, and in consequence the Secretary has issued the following statement:

> "You are advised that although the practice of grounding electric service lines on domestic water service pipe is in effect in most cities, the water department does not place the connections, derives no benefit from them, may be damaged by them, and tolerates them only because of their reputed importance in providing electric service. While the water supply industry as a whole does not accept responsibility for the providing of means of disposal of stray or waste electric current, water department executives are advised not to order the removal of electrical grounds of alternating current systems from water pipes unless they have been informed by competent legal counsel that such removal order can be supported in the case of court action."

1939 Convention Progress

Every effort is being made by the Convention Management and the Technical Program Committees to make the 1939 Convention even bigger and better than the 1938 Convention in New Orleans. The following statement was just issued by Secretary Jordan:

"Preparations for the 1939 convention are in full swing. The place is Atlantic City. The dates are June 11th-15th inclusive. Headquarters are the Chelsea and Ambassador hotels. Consult the advertising pages of the January Journal for hotel rates, etc. Make your reservations direct with the hotel *and make them soon.*

"Bill Orchard is again in charge of convention arrangements and says that at least 1500 people will attend. That will be a real record breaker.

"Linn Enslow has a fine technical program in development which will be announced in due time."

"On Friday the 16th of June, a special train will run from Atlantic City to New York. Arrangements have been made with the Hotel Pennsylvania to have set aside 125 rooms —and members will be able to visit the New York World's Fair as long as they wish.

LEAK LOCATION

Something of Our Experience in Bristol, Virginia

The Author

By P. A. GOODWYN
City Manager,
Bristol, Virginia

AS STATED in the account appearing in WATER WORKS & SEWERAGE for October, 1938, which covers the writer's remarks before the Virginia Section of A.W.W.A., Bristol, Virginia, was softening and filtering a very large quantity of water per capita, but this was not being conserved; it was going to waste through leakage. I realized this must be stopped to correct an unusual cost for operation on a per capita basis.

A pitometer survey had been made and revealed some large leaks, especially in two locations. However, we had never been able to locate the definite point so that steps could be taken to stop the leakage. The reason for this failure appears later.

Now, after various unsuccessful efforts over a period of nearly ten years, two major leaks have been recently located with the use of one of the modern radio-type leak locators.

Real Hidden Leaks

You might ask why the water from these leaks did not come to the surface. If you have ever had experience in a cavernous limestone country, you would understand why. The water from the leaks was going into such ground, and we finally traced it coming out in the bottom of a creek some distance away. This was only located after we had found the leak, by the method to be described, and put dye in the water which could then be seen in the creek. Interestingly, the main at the point of one major leak was not more than four feet below surface.

It took about two days of readings with the radio leak-detector before the first major leak was finally located. When successfully located, it was found that the packing around the bell had blown out. This leak was causing a loss of 100,000 gallons of water every twenty-four hours. Our leak-finding expedition was in reality a demonstration requested by the agent for the leak detector company. When this leak was definitely located, the salesman had sold his detector to me without further question, or need for additional demonstration. It had already paid for itself in my opinion, which was later confirmed without doubt.

A More Difficult Test

Now this was not the only leak that the pitometer survey indicated we had. There was another on our sixteen inch main bringing our major supply from the filtration plant to the city. The leak detector was immediately transferred to this point, and after a day's trial this leak was effectively located also.

At this point the main was more than fifteen feet below surface and within thirty feet of a creek through which the main passed. However, this depth below surface did not prevent the detector from doing its uncanny work. The leak proved to be due to a shifting of the main which caused a spreading at two joints. These two joints were responsible for another one hundred thousand gallon leakage, likewise going through cavernous formation to a creek.

It may be hard to believe, when I tell you that both of these leaks were located in less than eighteen inches from the point where the reading of the radio-detector instrument indicated they were.

Now you can realize the financial saving to our city resulting from stopping the loss of 200,000 gallons of softened water a day. This waste had been going on for a ten year period, but fortunately we have a gravity system and did not have a pumping charge added to the cost of chemicals for treating the water. We were also fortunate in having a sufficient supply to take care of the needs of the city above the leakage.

In addition to the monetary saving the stopping of the leaks increased our pressure from around 55 lbs. to 70 lbs. during the heavy peak

Leak Detection and Location
C. D. Addington, Asst. City Engr., is here tuning the leak locator with the sound pick up "mike" on the paving over the main.

load in the day, and to 80 lbs. during the night period.

A Friend Indeed

Now who was this "friend in need" that performed such a good service for Bristol? It was Mr. Joe Hupp, representing the Water Leak Detector Company of Columbus, Ohio. He called at my office one day and requested a trial of his "Universal" Leak Detector and Pipe Locator. I requested our City Engineer, Mr. W. H. Fawcett, who has since passed away, at great loss to us, to see what the machine would do, but admittedly with very little feeling that anything worthwhile would be accomplished. However, much to my amazement and delight, and after what Mr. Hupp said was one of his hardest trials, the "miracle" was successfully performed.

This machine operates on the radio principle. From it a wired connection is made to a fire hydrant or service line and then by taking various readings with the recording instrument you can locate practically the exact spot of the leak, whether it be a large or a small one. The particular model purchased by us is known as the Standard Light Duty "Universal" Water Leak Detector with Pipe Locating Attachments—Instrument 1170.

"On Location"

In this picture Mr. Addington is using the pipe locator attachment to our "Universal" machine in successfully locating a deep main.

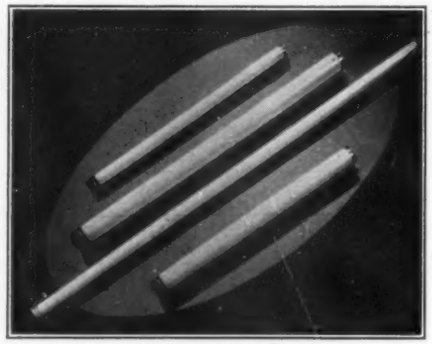
I hope that the readers of this article who have leaks, may profit by our experience, and save your community from a running financial loss and waste of a valuable commodity—"WATER."

LIGHTING ADVANCES WITH FLUORESCENT MAZDA LAMPS

A new era in artificial lighting, initiated in 1938, will probably be the result of the development of the new fluorescent lamp. In reviews of electrical developments of the past year, fluorescent lighting is being hailed as the greatest advance in light production in many years.

The quality of light from the new daylight lamp is the closest approach to natural daylight that has ever been produced. Most interestingly the economy in current consumption exceeds anything heretofore attained in producing like intensity or approaching quality of light. The new fluorescent lamps also make possible economical tinted lighting of remarkable qualities and shadings for pleasingly artistic effects.

The new tubular fluorescent lamps (here pictured) contain a small globule of mercury, a small quantity of argon gas under rarified pressure, and tungsten wire electrodes covered with an electron emitting material. In operation the mercury arcs produce ultra-violet radiations, that activate the fluorescent chemicals with which the inside surfaces of the tubes are coated. These compounds, called phosphors, are energy transformers. They step the invisible ultra-violet radiations down to the visible part of the spectrum. Application of selected and properly blended phosphors make possible the production of radiations in practically any part of the spectrum, from the ordinary fluorescent daylight lamp. Such lamps are already going into a wide variety of uses in industrial as well as artistic lighting. In the latter direction, notably in lighting the coming World's Fairs.



Specimens of the New Tubular Lamps

While these new lamps are at present more costly than ordinary Mazda lamps, the major initial cost being the small transformers required, the saving in watts per unit of light produced is appreciable.

Another New Mercury Lamp

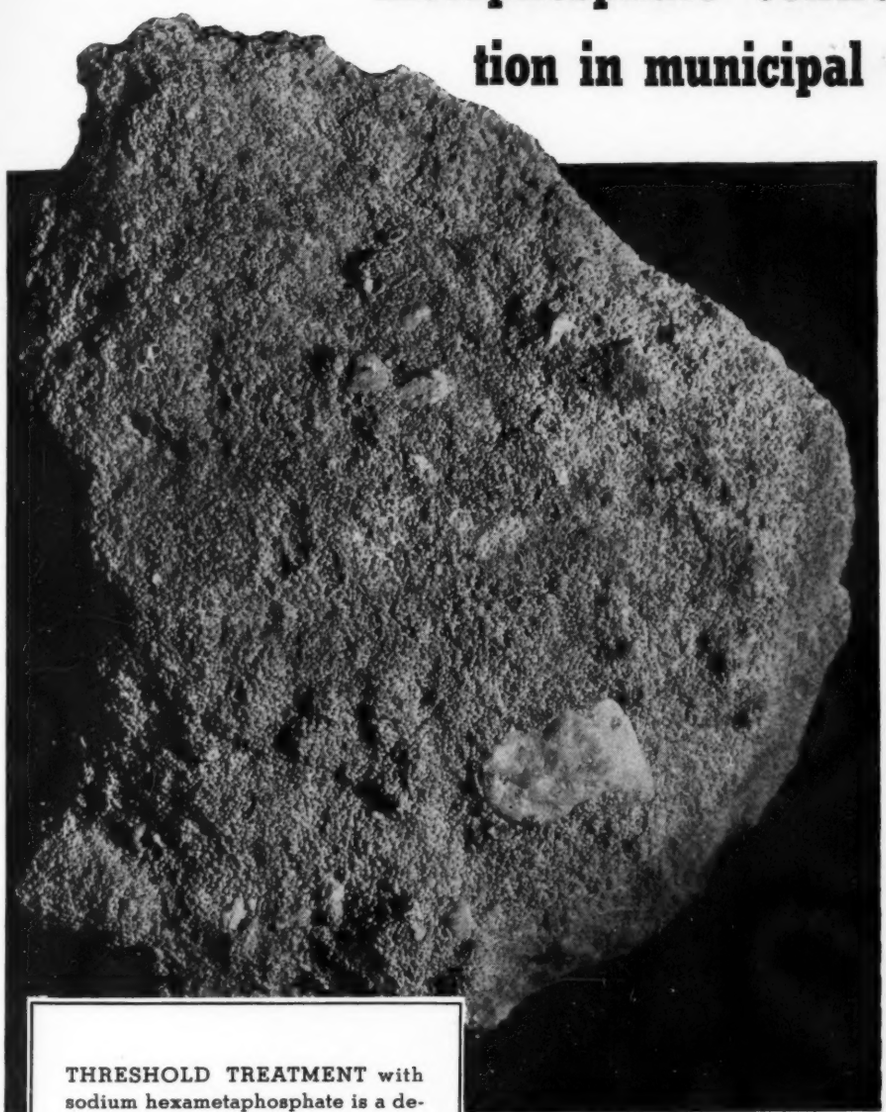
Another new mercury-arc lamp, which produces the high efficiency of 65 lumens per watt, is only three inches long. It consists of a quartz capillary tube surrounded with a glass water-jacket for preventing fusing of the quartz tube.

This new lamp is especially of interest in photo-engraving and blueprinting. It requires less current than other lamps of equivalent light production and, because of steadiness of the mercury arc, produces superior work and greater uniformity over a much increased area of exposure. Likewise, increased speed in blueprinting at lower wattages.

If interested in these two advances in electric lighting, pertinent literature is obtainable from either Westinghouse or Pittsburgh, or "G-E" of Schenectady. We have seen demonstrations with the new daylight and tinted fluorescent lamps. The effects were so impressive as to warrant this recounting of what appears to be *truly* the beginning of a new era in artificial lighting.

"One part in a Million..."

Threshold Treatment with sodium hexametaphosphate controls after-precipitation in municipal water systems . . .



THRESHOLD TREATMENT with sodium hexametaphosphate is a development of Hall Laboratories, Inc., Pittsburgh, Pa., world-famous authorities on water conditioning.

CALCIUM CARBONATE encrusted sand taken from a water supply filter bed. Threshold Treatment with sodium hexametaphosphate prevents the after-precipitation of calcium carbonate typified by the above rock-like formation.

HERE'S a fact so amazing that, as research engineers, we hesitated to believe it ourselves—but its truth has been definitely established both in the laboratory and actual practice. Only .5 to 2 parts of sodium hexametaphosphate per million parts of water positively stops the encrustation of filters and controls the formation of scale in all parts of the distribution systems.

No longer is it necessary for any municipal water supply to cause trouble due to scale because the cost of Threshold Treatment is always low. Its benefits carry over from your system right into the homes and plants of every user, where it minimizes deposition in hot water heaters.

The advantages of Threshold Treatment with sodium hexametaphosphate are so great and its application so simple that it deserves serious attention from all water supply executives. We will gladly send more information or one of our service engineers. Just mail the coupon.

FOR INFORMATION — MAIL THIS COUPON:

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300 ROSS STREET PITTSBURGH, PA.

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Please send information on Threshold Treatment for ☐ Municipal Water plants ☐ Sewage Disposal plants.

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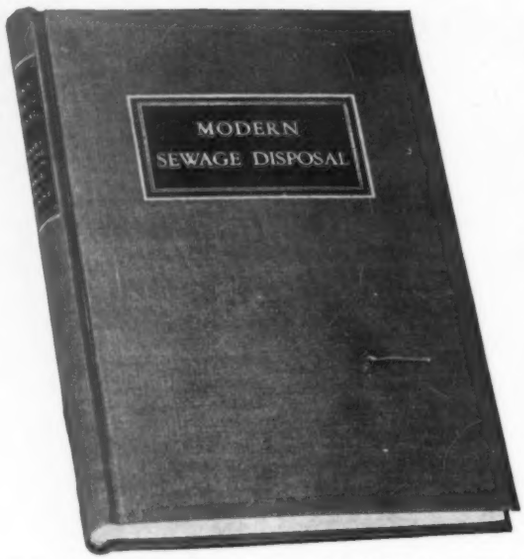
IT'S NEW!



This Anniversary Volume . . .

is published to commemorate ten years of service by the Federation of Sewage Works Associations and is dedicated to the many operators of sewage works, research workers, engineers and public officials who have contributed to the development of the art of sewage treatment in the past.

Edited by Langdon Pearse, MODERN SEWAGE DISPOSAL is a presentation of the assembled work of 35 authors who contributed the 32 chapters here listed:

C. A. EMERSON, JR.: The Federation and Its Relationship to Sewage Disposal.

C. G. HYDE: A Review of Progress in Sewage Treatment During the Past Fifty Years in the United States.

LANGDON PEARSE: Functional Outline of Processes of Sewage Treatment.

SAMUEL A. GREELEY: Sedimentation and Digestion in the United States.

KARL IMHOFF: Sedimentation and Digestion in Germany.

W. E. STANLEY: The Trickling Filter in Sewage Treatment.

F. W. MOHLMAN: Twenty-five Years of Activated Sludge.

W. DONALDSON: Chemical Treatment of Sewage.

LINN H. ENSLOW: Chlorine in Sewage Treatment Practice.

GEORGE B. GASCOIGNE: Mechanical Equipment in Modern Sewage Treatment.

MORRIS M. COHN: Utilization and Disposal of Sewage Sludge.

W. D. HATFIELD: The Works Laboratory.

C. A. HOLMQUIST AND C. C. AGAR: Bettering Sewage Plant Operation.

MAX LEVINE: Bacteriological Aspects of Sewage Treatment.

EARLE B. PHELPS, Bio-chemistry in Sewage Treatment.

W. C. PURDY: Limnological Aspects of Sewage Disposal.

N. T. VEATCH, JR.: The Use of Sewage Effluents in Agriculture.

H. W. STREETER: Disposal of Sewage in Inland Waterways.

A. K. WARREN AND A. M. RAWN: Disposal of Sewage into the Pacific Ocean.

A. D. WESTON: Disposal of Sewage into the Atlantic Ocean.

WILLEM RUDOLFS: Sewage Research.

HAROLD E. BABBITT: Research in Sewage Treatment at Educational Institutions in the United States.

C. E. KEEFER: Administration of Sewage Treatment Works.

GORDON M. FAIR: Mathematical Aspects of Sewage Research.

C. E. A. WINSLOW: Pioneers of Sewage Disposal in New England.

ABEL WOLMAN: State and Other Governmental Functions in the Control and Abatement of Water Pollution in the United States.

H. T. CALVERT: Governmental and Local Functions in the Control of Sewage Disposal in Great Britain.

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A. HEILMANN: Sewage Treatment in Germany.

L. F. WARRICK: The Prevalence of the Industrial Waste Problem.

ROBERT SPURR WESTON: Treatment and Disposal of Industrial Wastes.

A 371 page reference work—MODERN SEWAGE DISPOSAL—is unique in the field of sewage and industrial waste disposal. Embracing 32 topics, covered in as many chapters written by authorities distinguished in their respective fields, this volume constitutes an important milestone in the history, development and trends in sewage treatment.

A production of the Federation of Sewage Works Associations, it has been priced so as to become available to the greatest numbers.

To Sewage Works Journal subscribers . . . . $2.50 per copy
To non-subscribers . . . . . $3.50 per copy
(Foreign postage of 33 cents is extra)

FEDERATION OF SEWAGE WORKS ASSOCIATIONS
654 Madison Avenue **New York, N. Y.**

TAXES-PEOPLE & PIPE

TAXES, people and pipe are three live subjects discussed in The Cast Iron Pipe Research Association's advertising in national publications read by influential citizens, featured by the slogan, "Public Tax Saver No. 1," which has created widespread interest. This educational advertising is for the purpose of *supporting public officials* in specifying a material which, though lowest in cost per service year, is frequently higher in first cost. Typical advertisements are shown in reduced size.

* * *

It is to the advantage of water works officials that the public shall realize that water mains represent about one-third of this country's 5-billion-dollar investment in public water supply systems—that more than 98% of these mains are cast iron pipe with a *known* useful life at least double the *estimated* life of other water main materials—that the consequent tax-saving, through deferred replacements alone, is enormous—and that cast iron pipe deserves to be advertised as Public Tax Saver No. 1.

"TAKE a good look, son. That's cast iron pipe and it won't have to be dug up and replaced for a century. Downtown there are cast iron water mains older than I am. Suppose the city had to replace them? All of us property owners would have to share the cost. I'm saving those extra tax dollars because cast iron pipe serves for a century. When you grow up to be a taxpayer, it will save *you* money, too."

* * *

Water mains represent about one-third of this country's 5-billion-dollar investment in public water supply systems. More than 98% of these mains are cast iron pipe with a *known* useful life at least double the *estimated* life of other water main materials. Because the tax-saving, through deferred replacements alone, is enormous, cast iron pipe is known as Public Tax Saver No. 1. It is the only ferrous metal pipe, practicable for water, gas and sewer mains, which rust does not destroy. Made in diameters from 1¼ to 84 inches.

Unretouched photo of cast iron water main installed in St. Louis more than 100 years ago and still in service.

CAST IRON PIPE
PUBLIC TAX SAVER NO. 1

THE CAST IRON PIPE RESEARCH ASS'N, T. F. WOLFE, RESEARCH ENGINEER, 122 SO. MICHIGAN AVE., CHICAGO

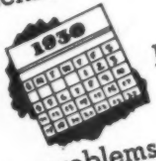
CAST Q IRON

Look for the "Q-Check" registered trade mark.
Cast iron pipe is made in diameters from 1¼ to 84 inches.

THE CAST IRON PIPE RESEARCH ASSOCIATION, THOS. F. WOLFE, RESEARCH ENGINEER, 1015 PEOPLES GAS BUILDING, CHICAGO

at your Service

INSURES PALATABLE
NUCHAR
DRINKING WATER

When you order Aqua Nuchar you receive a product that is backed by over 25 years of constant research and technical development in activated carbons. For the past nine years  Industrial Chemical Sales has concentrated its attention on the problems of water purification.

Today, the service of our technical staff, who have acquired wide knowledge and experience in water plant taste and odor control, is at the disposal of any water official in need of advice or assistance without any obligation.

INDUSTRIAL CHEMICAL SALES
DIVISION WEST VIRGINIA PULP & PAPER COMPANY

230 Park Avenue, New York
CHICAGO, 205 W. Wacker Drive
PHILADELPHIA, 1322 Widener Bldg.
CLEVELAND, 417 Schofield Bldg.

COPPER TUBING VS. BRASS PIPE

Topic Featured at January Meeting of N.E.W.W.A.

As Reported by
DON C. CALDERWOOD
Asst. Supt., Pennichuck Water Company, Nashua, N. H.

The question of brass vs. red-brass vs. copper tubing brought up on the floor during the December meeting of the New England Water Works Association, but postponed due to the lateness of the hour, constituted the principal topic on the afternoon program of the January meeting.

There appeared to be some concern as to the advisability of using pure copper tubing in connection with certain types of waters. Realizing the importance of this question to the industry at large, but prevented from being present to listen in on such important discussion, we prevailed upon Mr. Calderwood to act as our ears in this case. The account to follow is condensed from his excellent report of the proceedings.—ED.

"Copper Tubing for House Services," by HARRY W. CLARK, Consulting Chemist, Whitman and Howard, Engrs., Boston, Mass.

Mr. Clark for 37 years served with the Massachusetts Department of Health, resigning as its Chief-Chemist in 1933 to enter consulting practice. His paper proved to be a summary of much of the experimental work performed during his connection with the State Department of Health. Amongst such were numerous corrosion studies, in connection with lead poisoning and the choice of service pipe materials. Concerning brass pipes and copper tubing, Mr. Clark stated that Massachusett's experiences had led to no universal rule, but ground waters with more than 17 p.p.m. of free carbon dioxide were likely to dissolve enough copper from copper tubing to create green stains on porcelain or enamel fixtures. However, the chief objection was the stain and not the question of danger from copper poisoning. He quoted from the British authorities to show that copper was not cumulative in the system, and that as much as 100 milligrams intake daily had been shown non-detrimental to the health of the individuals. Mr. Clark concluded that the modern pure copper tubing was in general a satisfactory service line material—in specific instances possibly less satisfactory than some other pipe material. Therefore, the advice of a competent chemist should be the safest procedure in matters pertaining to corrosivity of water and service pipe materials. The solution might be anti-corrosion treatment of the water, as overall more economical and practical than going to more costly non-corrodible materials. These closing remarks threw open the question of the value and limitations of copper and its alloys for service pipes.

ARTHUR R. G. BOOTH, Chief of Laboratories, Mass. Dept. of Health, looked to for a further clarifying statement, said that medical authorities seemed to be in agreement that copper in quantities obtainable in waters, acceptable from the standpoint of palatability, would not harm the consumer.

F. H. KINGSBURY, Senior Engr., Mass. Dept. of Health, affirmed the facts and opinions presented by Messrs. Clark and Booth, stating that green staining could be checked by economical corrective treatment of the supply. Also, tinned copper tubing was obtainable if more practical to adopt it than to treat the water.

F. G. SMITH, Engineer, Copper and Brass Research Association, rose to explain that, taken alone, pH value of a water would not reveal the relative corrosivity of a water. The nature of mineral salts in natural waters had a considerable bearing in determining the relative values of copper and copper alloys as corrosion resisters. The choice lay between pure copper tubing and red brass (85 copper and 15 zinc), whereas yellow brass had decided limitations because of rapidity of dezincification, leaving a weakened copper structure of little strength.

MR. COLE—whose connection and interest was not stated (believed by your reporter to represent some copper or brass company)—suggested use of marble or limestone chip contact beds as often the most practical method to reduce water aggressivity in connection with the smaller systems. (And, systems of institutions, estates, industry and the like, we would add. If interested in the design of such successful limestone contact units, see the 1938 Reference and Data Issue of this magazine—April, 1938—section on Water Treatment and Corrosion Control. Likewise, see an article by I. M. Glace on page 293 of the magazine section of the same issue, revealing operating results with limestone beds.—ED.)

Rules and Regulations of the New Hampshire Dept. of Health, Pertaining to Brass and Copper Piping

At this juncture Mr. Calderwood (Nashua, N. H.), in the absence of a representative of the new Hampshire Dept. of Health, read excerpts from the "New Hampshire Health News" (December, 1938) which, for the purpose of clarifying some possible confusion as to the merits of brass, copper and red-brass water pipes, justifies reproduction here. We quote, in part, from the pamphlet—*"Concerning Brass Water Pipe."*

"Regulation 3 under the plumbing law (of New Hampshire), as recently amended, stipulates that, where brass pipe is used, only the red variety shall be installed, the effect of this being to prohibit the use in New Hampshire of yellow brass in connection with public water supplies. While, so far as is recalled, this item elicited no criticism from plumbers during the various hearings held prior to the adoption of these regulations, it has been the subject of considerable comment and some controversy in recent weeks, i. e., since the matter has come more intimately to the attention of plumbers in connection with pending jobs and the purchase of this material from supply houses.

"A few plumbers have contended that yellow brass is just as good for water service as the red variety and,

being cheaper, should be permitted use. One architect recently has gone so far as to assert, in connection with a building construction that would involve a corrosive water, that yellow brass is *superior*—in which contention he is unquestionably profoundly mistaken, as will appear from what follows.

"In connection with this question, this department has been in communication with the leading manufacturers of brass pipe. Their representatives have called at this office and the matter has been discussed with them at length, including a metallurgist specially delegated to come to Concord for this purpose by one of the best known concerns.

"There were no differences of opinion between these manufacturers as to the points locally at issue. As a result of these conferences the following conclusions are advanced—which should be of especial interest not only to plumbers but to property owners:

"1. The cheaper yellow brass, consisting of 60 per cent copper, 40 per cent zinc (so-called muntz metal), is grossly unfit for water piping, dezincification and consequent failure tending to be rapid. This form is said to be distributed by only a few of the smaller concerns, largely through catalog houses, and used on competitive jobs or where a low price is demanded.

"2. A better grade, consisting of 65-67 copper, as manufactured by the larger companies and for a time advocated by these for this purpose, has proven disappointing. While dezincification is less rapid than with 60 per cent copper, it does occur, and with corrosive waters (such as prevail in this state) the metal is rapidly attacked and failures are but a matter of a short time. Not infrequently this takes the form of 'plug' dezincification, resulting in numerous holes for leakages. In other cases, the corrosive action is uniformly distributed, leading in the course of time to complete crumbling of the pipe walls. Even this better form of yellow brass is wholly unfit for hot water systems, also for laying in acid soils.

"3. *Red* brass, which contains 85 per cent of copper, is virtually free from dezincifying effect. It is the only variety which should be used for water.

"4. It has been definitely established that *red brass* (85 per cent copper) *withstands corrosive action substantially better than does straight copper*, it appearing that this composition represents the optimum in this respect.

"5. With any form of brass, solution of traces of copper occurs, especially in the hot water system, this being evidenced by formation of green stains under the faucets. With red brass the degree of such staining usually is but slight.

"6. The regulation stipulating use with our water supplies of the red variety of brass, where brass is used, is a reasonable and proper one. Not only is this regulation justified from the standpoint of insuring durability (although even red brass may be unsuitable for a few waters), but it has a sanitary basis in that the solution of these metals tends to impair potability and general fitness for domestic use.

"While nothing contained in the plumbing regulations specifically places any restrictions upon the use of untinned copper water tubing, it seems safe, on the basis of our observations, to advise of its unfitness in substantial lengths for a majority of our New Hampshire waters."

[NOTE—The italics in the above are our own, to emphasize the conclusions reached by the New Hampshire authorities pertaining to the higher suitability of red-brass pipe when compared with copper tubing for the more aggressive waters. In this connection an authoritative article evaluating brass, red-brass and copper tubing in water service, written by N. W. Mitchell, a metallurgist of experience, is to be found in the May, 1938, issue of this magazine. It is worth reading.—ED.]

An Opinion on Federal Taxation of Salaries of Municipal Employees

Before the New England Water Works Association came HENRY F. LONG, long Commissioner of Corporations and Taxation for the Commonwealth of Massachusetts, to give members the benefit of his opinions as to what was likely to happen in connection with the move afoot in Washington to collect income taxes from all municipal and state employees and to tax securities issued by states and their political subdivisions.

Mr. Long said that there was a popular demand that state, municipal and governmental employees be taxed on income. Looking for a source of additional revenue, imposing such taxes looked to be a good expedient, as did the taxation of state, county and municipal securities. There seemed little doubt but that laws to this effect would be passed. In his opinion only securities issued *after* passage of the new law would be taxable by the Federal Government.

Concerning municipal employees' salaries, Mr. Long was reassuring. It was his opinoin, based on the five cases reviewed, that full time city water works or sewerage employees' salaries would be exempt on the score that water and sewage services were governmental functions and therefore non-taxable.

The cases cited were:

Collector vs. Day—Wall 113

James vs. Dravo Contracting Co. —302 U. S. 134

Brush vs. Collector—300 U. S. 352

Helvering vs. Gerhardt—304 U. S. 405

McCullough vs. Maryland — 4 Wheat 315

The present concern of the water works employes is whether or not the Revenue Collector is to demand payment of back (cumulative) taxes over the period of years no income tax has been paid.

Resources Committee Sets Up a Technical Public Works Committee

In order to bring together Federal officials concerned with Public Works and citizens especially qualified to advise on the economics and timing of public construction activities, the National Resources Committee has named a Technical Public Works Committee. Colonel Henry M. Waite was named chairman of the committee and Frank W. Herring, of the American Public Works Association, vice chairman. This committee has been asked to assist the National Resources Committee in continuing its preparation of 6-year programs of public works and in stimulating the preparation of such capital budget programs by states and cities.

In addtion the new committee will undertake studies to determine the most effective utilization of state and local public works for stabilizing the construction industry, and to analyze the place of public construction in providing employment and increasing the national income.

"WATER WORKS AND SEWERAGE WEEK" IN NEW YORK CITY

Embraces A.W.W.A., A.S.M.E., A.S.C.E., and N.Y.S.S.W.A. Meetings—Plus an Inspection Trip

THAT January week each year, in which the Annual Meeting of The American Society of Civil Engineers is held in New York City, now offers so many meetings and activities of interest to sanitary engineers and plant operators that it may appropriately be dubbed "Water Works and Sewerage Week." For instance here is a partial schedule of meetings, and events during the last half of the week of January 16th-21st.

January 18th—Annual Meeting of the A.W.W.A. Board of Directors.

January 18th—Sanitation Division Am. Soc. Mechanical Engrs.

January 19th—Sanitary Eng. Division Am. Soc. Civil Engrs.

January 19th—Joint Dinner of above Division and N. Y. Sewage Wks. Ass'n., followed by A.S.C.E. Smoker.

January 20th—Annual Meeting, N. Y. State Sewage Wks. Ass'n.

January 20th—Annual Meeting, Board of Control, American Federation of Sewage Wks. Ass'ns.

January 21st—Joint Trip of Inspection to New York City's New Tallmans Island Treatment Works—followed by preview of N. Y. World's Fair.

A.S.M.E. Program

After an all day session of the Directors of A.W.W.A., in which the unexcelled progress of the Association was reviewed, new plans made, a new president and vice-president chosen, honorary members elected and annual awards voted deserving members, and a bigger, better and carefully planned budget approved, [as recounted elsewhere in this issue] some of the members attended the evening session of the local Sanitation Chapter of The American Society of Mechanical Engineers to hear a symposium of papers dealing with—

"Gas Engines in By-product Power Development at Sewage Works"

Speakers:

(1) W. L. RUSSELL, Manager, Gas Engine Div., Worthington Pump and Machinery Co., Harrison, N. J.

Incoming and Retiring Presidents
N. L. Nussbaumer, Buffalo
Fred J. Biele, Huntington

(2) P. W. EELLS, Mgr., Technical Sales, LeRoi Engine Co., Milwaukee, Wisc.

(3) E. D. WEST, Manager of Sales, Climax Engineering Co., Chicago, Ill.

(4) COL. OLIVER F. ALLEN, Cons. Engr., New York City, N. Y.

A.S.C.E. Program

On January 19th came the full day program of the Sanitary Engineering Division of the American Soc. of Civil Engineers, before which COL. THOS. H. WIGGIN, Consulting Engineer of New York City, highlighted his interesting annual report on **"Water Supply Engineering Progress and Developments"** developed by him as Committee Chairman. Again, as in previous years, this report was accepted, with commendation and appreciation for its comprehensiveness and illuminating context. It will appear in A.S.C.E.'s **"Civil Engineering."**

An important contribution consisted of the completed text on **"Water Purification Research and Plant Design,"** which was presented in abstract by JOSEPH W. ELLMS, Sewerage Engineer and Commissioner, Cleveland, Ohio as committee chairman. This contribution takes the form of a worthy manual on **"Water Purification Plant Design,"** as distinctive from that dealing with **"Water Purification Practices and Plant Operation"** now in form for early printing and distribution by the American Water Works Association. Just how the A.S.C.E. text is to be reproduced and distributed is yet to be determined by the Society's Committee on Publications.

A worthy contribution to sewage treatment practices was the exhaustive paper (a treatise in fact) on **"Problems, Developments, Status and Trends in Activated Sludge Practice and Plant Design,"** by ROBERT T. REGESTER, of Whitman, Requardt and Smith, Engineers, Baltimore, Md.

A paper dealing with **"Engineering Aspects of Milk Sanitation"** presented by LESLIE C. FRANK, Senior Sanitary Engineer of the U. S. Public Health Service, a pioneering authority in this branch of sanitary engineering, was discussed by WALTER D. TIEDEMAN, Principle Sanitary Engr., of the N. Y. State Dept of Health.

Engineer-Health Officers

In the closing hour of the meeting of A.S.C.E. the following resolution was presented by L. H. ENSLOW, as a representative of the Executive Committee, and was unanimously passed.

WHEREAS, it has come to the attention of the Executive Committee of the Sanitary Engineering Division of the American Society of Civil Engineers that a report of the National Health Officers Qualifying Board to the Conference of Mayors has recommended "that only physicians be eligi-

ble to serve as Health Officers in American Cities," and

WHEREAS, there are a substantial number of public health officers with established records of proficient service who have been basically trained as sanitary engineers, and

WHEREAS, The American Public Health Association, a renowned organization of medical health officers, has within its membership many leaders who were trained as engineers; and has, from time to time, seen fit to recognize such sanitary engineers by their election to the presidency of this important organization of health officers, and

WHEREAS, the recommendations to the Conference of Mayors, above referred to, namely—limiting the field of health officers to physicians, is inconsistent with proven public health practice—and, is illogical. Therefore,

BE IT RESOLVED, that the Sanitary Engineering Division of the American Society of Civil Engineers go on record as pointing out the fallacy of such recommendations; and, that a copy of this resolution be sent to the Conference of Mayors.

Joint Dinner and Smoker

After adjournment members and guests of the Sanitary Engineering Division and the N. Y. State Sewage Works Association participated in the Annual Joint Dinner, held for the past several years, to enjoy a program of entertainment directed by "Bill" Orchard, and adjourn to attend the Annual Smoker of A.S.C.E., there to see the thrilling deep-sea motion pictures of Capt. John Craig, and rub elbows with fellow members. Honored was the Sanitary Division by the presence of Col. Donald H. Sawyer, A.S.C.E.'s new president, as the brief and only

Presentation

To Chas. C. Agar, past-president, the Kenneth Allen Memorial Plaque—being presented by Morris Cohn (left) Award Committee Chairman.

speaker of the evening, whose theme was **"Can Engineers Make Jobs and Reduce Unemployment?"** In this he emphasized community betterments in water supply, public health, housing and sanitation, as amongst the most promising avenues of engineer service and future employment correction. From the spirit (singular and plural) of the evening he remarked that the "blues" had seemingly not overtaken the Sanitary Division. So, they all went over to the Smoker —and *where* after?

Meeting of the N.Y.S.S.W.A.

The New York State Sewage Works Association holds no "Sunrise Breakfast" in connection with its Annual Winter Meeting in New York City, but on hand for an early registration was one of the largest groups ever to attend a N.Y.S.S.-W.A. meeting. The registration list of better than 300 names shows more guests than members, with the country represented from coast to

W. Donaldson Director Div. of Sewage Disposal ("Now he's Admiral of a Sludge Navee")

William Raisch Consulting Engineer (Chairman Local Arrangements Committee)

coast and from the Mexican Gulf to Hudson's Bay.

For the first time the new book **Modern Sewerage Practice** was on display and sale, with the business manager's office of the Federation of Sewage Works Association (publishers) early hanging up the "Sold Out" sign and taking orders at $2.50 per for mail-delivery. This volume, developed to serve as a "Manual on Modern Sewerage Practice," was produced under the editorship of Langdon Pearse of Chicago to appear as a commemorative work, marking completion of the first 10 years in the history of the Federation of Sewage Works Associations in America. Its initial sales history, seems to have already proved the wisdom of the Federation Board of Control, which conceived the idea and staked its success.

Business Meeting

"The first order of the day was "Business" and committee reports. Concerning "The State of the Association," Secretary Bedell reported that N.Y.S.S.W.A. could still lay claim to being the "World's Largest Sewage Works Association" because with 130 new members during 1938, to offset a loss of 50, the January, 1939 list would show a new membership high of 595* members in good standing. The 595th member deserved especial mention since this number fell to the first and only woman member of the Association, whereupon Miss Mona Cordell, "Doc" Edward's assistant chemist in the Wards Island (N. Y.) Plant laboratories, took a bow—and, the one of the best looking members from the 594 "bucks" (name withheld on advice of counsel) took Miss Mona to the World's Fair luncheon during the inspection trip.

It was announced also that, stimulated by the successful history and prowess of the Long Island Section of the Association, a third section has been established under authorization of the executive committee. The new Western Section, with 40 members, serves the Buffalo and Rochester area by holding regular interim meetings, as does the Genessee Valley Section in the central area.

(The results attained in the sectional meetings of the N.Y.S.S.W.A. point distinctively to the merit of the system, the adoption of which may well benefit other members in the Federation—particularly in reaching and best serving the plant operator group.—Ed.)

Committee Reports

Amongst committee productions came the final report of the Safety Committee (a joint committee of the N. Y. and New England associations) briefed by N.Y.S.S.W.A.'s Chairman, J. L. Barron. In its three sections are the "Do's and Don'ts of Safety"—one section comprising "A Safety Code" for posting at plants. It is anticipated that this helpful report will be printed in the Sewage Works Journal.

RALPH C. SWEENEY, Chairman of the Gadget Committee, reported the association's most successful gadget year.

CHAS. C. AGAR, Chairman of the Short School Committee, in an important announcement, revealed that honorarium scholarships were being established by friends of the Association to assist worthy operators finance short school attendance. To date three $50.00 honorariums had been assured by manufacturers or others, with three or four more reasonably expected. Applicants for such benefits are to be carefully weighed and selected by the committee.

* [Before the meeting was over the membership had passed the 600 mark.]

ROBERT C. WHEELER, Chairman of the Legislative Committee, reported that fortunately a New York bill requiring proof of actual injury to public health, before demands for stream pollution abatement could be issued by the N. Y. Department of Health, had died in Committee. Unfortunately, another bill making appropriations for needed stream surveys had also died in Committee. Governor Lehman had vetoed a bill legallizing issuance of revenue type bonds for financing sewerage betterments. The existing N. Y. law permits issue of such bonds, but only for purchase by Federal agencies.

Officers

The following officers were announced as elected:

President—N. L. Nussbaumer, Cons. Engr., Buffalo, N. Y.
Vice-Pres.—Geo. C. Andersen, Supt., Rockville Center, L. I.
Sec'y-Treas.—A. S. Bedell, State Dept. Health, Albany, N. Y.
Ass't-Treas.—J. C. Brigham, State Dept. Health, Albany, N. Y.
To the Executive Committee:
Channel Samson, Supt. of Sewerage, Kenmore, N. Y.
H. H. Wagenhalls, State Dept. Health, Albany, N. Y.
Rodney E. Cook, County San. Engr., Riverhead, L. I.

Awards and Presentations

Annually two Kenneth Allen memorial awards are made by the Association—one to a member at large, one to a plant operator. This year the first award went to Chas. C. Agar, past-president of the Association, for his paper "Practical Methods for Prevention of Dairy Waste Nuisances," which was presented before the joint meeting with the American Public Health Association and published in Sewage Works Journal.

No operator award was voted this year by the committee. No operator produced a paper which could be considered up to the specifications on which the award is based. However, the paper by operator Geo. E. Henkel, "Operation of the Jamaica, N. Y. Chlorinating Station" (published in Sewage Works Journal) was voted as the best operator's paper of the year. And, the author was urged to contribute a companion paper, revealing certain results of his original studies in chlorination, in order that the two papers might be jointly considered in the award for 1939.

A feature of the luncheon and award session was no speeches and but few introductions. Instead a surprise presentation was made to all living past-presidents and the retiring president of the Association—such having taken the form of a handsome watch-chain key, bearing the official emblem of N.Y.S.S.W.A. and appropriately engraved. In recognition of the long tenure of office, Secretary Bedell was presented with a key specially voted by the Executive Committee.

Illustrative of the "esprite de corps" in the Long Island Section, brother members in the Section made a special presentation to retiring president Fred Biele. In its wrappings it looked like a "dog-house" to us, but inside a flustered "Prexy" found a handsome travelling bag and a matched brief case. After a word of appreciation, his next remark will go down in history—"Well, gentlemen, if there's nothing more to come up, I will call this meeting adjourned." (Laughter.)

Jas. A. Tobey (Dr. P.H.—L.L.D.) New York

R. C. Sweeney State Dept. of Health, Albany

Inspection Trip

The joint post-convention inspection trip this year took better than 200 members and guests to the almost completed Tallmans Island Treatment Plant of New York City, to see what will be one of the prettiest plants in America, in sight of one of the famed Long Island parkways and but a stone's throw from the New York World's Fair site. Here also was found America's largest sewage works gas engine installation, comprising 8 engines to develop in all 3,500 horse-power, for driving pumps and blowers. To supplement sludge gas a tie in has been made with the gas company's mains.

For Tallmans Island a quick tour in buses was made through the World's Fair Grounds, with luncheon and a review of the plan and arrangements of the Fair, leaving little doubt that the New York World's Fair is to be more outstanding than even New Yorkers have realized. For the inspection arrangements and tour, went a vote of thanks to William Raisch and W. L. Sylvester—the local committee.

Technical Sessions

(PRESIDENT, FRED S. BIELE, PRESIDING)

The opening paper on the technical program proved of outstanding interest, taking the form of a review of—**"The Legal Aspects of Stream Pollution,"** by JAMES A. TOBEY, Director, American Institute of Baking, New York City.

Doctor Tobey, a former non-medical Health Officer, is a Dr. of Public Health and LL.D. member of the New York Bar. He spoke authoritatively and interestingly on general considerations and guidance in public nuisance and stream pollution law. His premise was that the so-called Common Law, calling for the reasonable use of streams, which had held many years in England was likewise the basis of American rights. So good and well until the question arises "What constitutes reasonable use?"—requiring long fought court procedures and delays in arriving at equitable rights. The day seemed at hand when the letter of stream pollution laws would not be important, whereas public opinion, sociological, administration and financial aspects would determine progress and accomplishments of a lasting nature. Another basic fact was that municipalities were no less subject to suit for pollution than private enterprise. Further, that contrary to the belief of some, precedent and length of time a waterway has been polluted gives no right to add more pollution, nor to continue to pollute in any degree or manner.

Hosts

Richard Gould, former Chief Engr., and now New York City's Commissioner of Public Works; Wm. Sylvester, Assistant Commissioner.

Here is an important and interesting disclosure by Dr. Tobey: In the eyes of law the installation of a public sewerage system constitutes a governmental function, and is subject to rights in such status. To the contrary, the operation of the dis-

posal system constitutes a utility or corporate and business function of the owners. Therefore, in operation failures or shortcomings of sewerage systems public or private owners were subject alike as to legal responsibility — accidents, pollution damage or what not. (What Dr. Tobey did not point out is that managers and responsible heads of municipal water or sewerage systems are actually subject to suit along with the city, for contributory or cal applications. He was of the opinion that the vetoed Barklay-Vinson Bill was the right initial step in a nation wide stream improvement program.

Discussors included SETH G. HESS, Chief Engr., Interstate Sanitation Commission and J. H. ALLEN, Chief Engr. of **Incodel** (Delaware River Compact). The former pointed out that requirements of the Commis-fied on the score that water works managers are either increasingly being given over sewerage systems to operate or are being required to handle billings and collections of sewer rents.—Ed.]

In the symposium it was stated that 35 states now have enabling acts permitting issue of revenue type bonds and financing through rental, or service charges. Also, in nine additional states sewer rental is being legally charged.

(1) Chas. R. Woodhull, City Engr., Newburgh, N. Y., and Geo. S. Eaton, Krajewski-Pesant Corp., New York City; (2) Officers of the new Western Section, Geo. E. Symons (Vice-Chairman), Chief Chemist, Buffalo Sewer Authority, and A. G. Martin (Chairman), Commissioner of Works, Tonawanda, N. Y.; (3) Tatlock (Dayton, Ohio), Fair (Harvard University), Mohlman (Chicago), Allton (Columbus, Ohio); (4) I. M. Glace, Consulting Engr., Harrisburg, Pa., Col. Hardenburg of "Public Works"; E. M. Jones, Simplex Valve & Meter Co.; (5) W. L. Bradshaw, Jeffrey Mfg. Co., and Wm. Raisch, Consultant, New York City.

culpable negligence in case of personal injury—particularly since such individuals are specialists in which high public confidence is presumed.

[See remarks of A. L. Jeffry, Municipal Counsellor, on page 1123 of the Dec. 1938 issue of this magazine.—Ed.]

Another enlightening fact at law —When a municipality accepts industrial sewage in its public system the city assumes all liability for damages chargeable against such industrial waste. There was one general exception in respect to pollution law. In the case of our tidal waters there has been no recourse to suit under the Common Law for pollution damage, by city or industry. Concerning legislation, Dr. Tobey said that ex-sion stated the minimum effluent quality for various tidal water areas, rather than stating a standard for quality of the receiving waters. Mr. Allen thought that compacts were less forceful than concurrent legislation drawn by participating states.

In reply to questions, Dr. Tobey stated that it is definitely expected that a revised pollution bill will pass Congress and be signed by President Roosevelt. Concurrent legislation by states would prove constitutional only if specific enough to preclude misinterpretation, and allow for details to be covered in rules and regulations drawn by the anti-pollution agency.

RALPH C. SWEENEY, District Engr. New York State Dept. of Health, the first speaker, revealed that only two New York cities were operating under the rental plan. At Plattsburg the new plant, and its operation, is being completely financed from such service charges. The careful preliminary plans and survey to establish an adequate and fair rental schedule had resulted in but few objections to the plan. On the other hand in another city, where the public had not been adequately informed and weak spots appeared in the plan of making a flat charge (38 per cent of the water bill), the proposed rental ordinance had been tabled because certain large users

(1) "Larry" Luther, Freeport, L. I., and E. A. Bell, Borough Engr., Essex Falls, N. J., with Jerry McCarthy (Monsanto Chemical Co.) in the distance; (2) Inspection of America's largest sewage plant engine installation (3500 H.P.) at Tallman's Island Plant; (3) John Warde (Rensselaer Valve Co.) and Harry H. Hall, Chief, Washington Suburban Sanitary District; (4) Luncheon in the World's Fair Grounds. Prof. Carpenter and Prof. Stanley are nearest the camera; (5) "Doc" Edwards (Ward's Island Plant), "Doc" Floyd Mohlman (Chicago) and George Schroepfer, Chief Engr., Minneapolis-St. Paul Sewerage Commission.

perience had shown new laws to oe of chief value in prevention rather than corrections, or in securing appropriations for stream betterment work. Although, basically and logically, pollution control should reside primarily with individual states, it seemed unfortunate that state laws were not more uniform as to basic features, with only such adjustments as were necessary for successful lo-

Sewerage Financing Through Sewer Rental

In a symposium on sewerage financing by way of sewer rental or service charges, four papers were presented.

[Incidentally by popular demand of its members, a symposium of this same topic is being planned for the Atlantic City Convention of the American Water Works Association. Such seems justi-finding the rate non-equitable. Thus, the importance of a thoroughly thought out plan and survey to take care of contingencies had been demonstated.

Going back in history, Brockton, Mass. (1894), appeared to be the original American city to adopt the sewer rental scheme. The plan has continued successful on the basis of taking only 40 per cent of the total charges from the general tax and

collecting service charges (rents) to supply the 60 per cent balance, with a safe margin. In Buffalo, because of the combined sewers and sewer design for the future, 45 per cent had been set as the ratio to take from the general tax fund and 55 per cent was to be raised in the form of rental or service charges. From both sources $1,500,000 per year had to be derived, $825,000 of which was being collected as service charges based on metered water consumption (18,000 meters); or, in the case of flat rate water takers, 40 per cent of the quarterly bill. The minimum in all cases had been set at 80 cents per month for every premise sewered. Adjustments had been set up for unsewered water, but even city properties and schools were being charged 1.6 cents per 1000 gals. of metered water used. The rent is payable at the City Treasurer's office quarterly with the water bills. Premises using private water supply were required to provide meters, but large users were permitted to measure only the waste to the sewers. In case of industrial wastes the Buffalo Sewer Authority is permitted to make adjustments or special charges, based on quality of wastes. Buffalo's experience to date has been satisfactory, said Mr. Sweeney. The general plan was expected to spread in New York, as it had in other states, even though financing with revenue type bonds had so far been restricted to issues sold Federal agencies.

M. W. TATLOCK, Supt., Sewage Treatment Works, Dayton, Ohio, interestingly revealed what sewer rental had accomplished in Ohio since 1923, in the direction of plant modernization and adequacy of treatment facilities, plant management and operating results. He reviewed improved conditions in the country at large, resulting from sewerage financing through revenue bond issues and the service charge route.

[As noted in our last issue, sewage treatment growth reveals 1200 new plants completed during the last 3 years, representing a 35 per cent increase in plants and, more important, a 52 per cent increase in population served.—Ed.]

Surveys had revealed the most popular rental charges to be based on water consumed.

In citing advantages from sewer rental, Mr. Tatlock placed (1) Assurance of efficient plant operation, first; (2) Economy of operating on a known budget, and lack of excuses for going before authorities for extra funds before the year end; (3) Security against law suits, the result of efficient plant operation and money available to make such possible the year through; (4) Last but not least, an equitable distribution of the cost of providing adequate sewers and sewage treatment.

E. J. Fort, Project Engr., Dept. of Public Works, New York City

Henry Liebmann, Design Engr., Dept. of Public Works, New York City

Citing Dayton experiences, Mr. Tatlock revealed that $100,000 had been impounded as "untouchable" surplus from sewer rental over a period of years. That "nest egg" had proved a "gold brick" as a ready to spend fund for plant betterments when assured Federal aid was based on such. Therefore a prompt W.P.A. project, involving financial assistance amounting to better than 800 per cent of Dayton's contribution, provided secondary treatment facilities. (See the cover picture in this issue.—Ed.) Another pertinent illustration of the value of rental income was to be found in the ability of Dayton's Sewerage Department to proceed promptly with major repairs and alterations, necessitated after the recent destructive gas explosion at the local plant. No special appropriation had been required—probably saving damaging newspaper publicity should funds have had to be found outside of the Department.

ROBERT A. ALLTON, Consulting Engineer, Div. of Sewerage Treatment, Columbus, Ohio, in citing first year experiences with the new rental ordinance of Columbus, revealed no pit-falls to date. (See articles by Mr. Allton in **Water Works and Sewerage** for August and September 1938.) Mr. Allton warned that "rental" was an unfortunate term because Columbus citizens could not understand paying rent on something (sewers) already paid for out of city taxes. Until the term had been changed to the more expressive "sewer service charge" much explanation had been necessary in selling the public on the soundness of the socalled "Rental Ordinance" to pay for sewerage operations. In Columbus, it had also proved essential to first make a check survey to determine the percent of water used by large consumers, or industry, which actually went into the sewers.

Also, important consideration (a contention) was that metered water used for lawn and garden sprinkling should be exempt from sewer service charge. A careful study in a thoroughly metered nearby city had been made to answer the contention. Interestingly the records for sprinkling months indicated only 8 per cent of the water consumed might be fairly exempted from the most extravagant group of water users. The next group used but 6 per cent more water in sprinkling season. Such a revelation was as surprising to the public as it was important information in billing practice. The matter of deducting water in summer proved an unimportant loss in revenue but a superb psychological gesture. In consequence, Mr. Allton's suggestion was that rate schedules be based on a 10 per cent deduction from total water used just "for the good of the cause" if nothing more. In the Columbus survey several large water users (railroads particularly) were sewer users in part only. The outcome of the survey revealed 25 per cent of total water sold to be exempt billing for sewer service on the semi-annual basis employed. The schedule of rates was made after determining this fact.

Concerning charges based on strength of sewage, Mr. Allton felt that at least for the time being the proper administration of such a

From Atlantic to Pacific

(1) C. J. Velzy, Supt., Sewage Works, Buffalo; (2) Clinton L. Bogert, Cons. Engr., New York; (3) Carl Beyer, from W. & T.'s Pacific Coast Office in San Francisco; (4) G. R. Frith, State Dept. Health Engr. from Atlanta, Ga.; (5) Sec'y Federation of Sewage Works Ass'ns. Harry E. Moses, Chief Engr., Penna. State Dept. Health; (6) R. S. Rankin, Manager of Dorr Co.'s Chicago office; (7) E. S. Chase, Cons. Engr., Boston.

schedule would be impractical if not impossible. Although provided for in the Columbus ordinance its use was not contemplated. Concerning delinquencies, there was now one small group of objectors delinquent, but there had been practically no difficulties with the balance and none whatever with industrial interests.

Commissioners
Michael Coffey and Frank Holland—both from Freeport, L. I.

Mr. Allton urged those contemplating sewer charges, based on metered water, to employ rate breaks in keeping with rate breaks on water bills. Also, to bill in terms of cents per 1000 gals. rather than on the basis of a fixed per cent of the water bill.

Interesting was the revelation that Columbus could show its small water users that they actually paid less based on water consumption than if a tax increase, based on evaluation, had been employed—a highly important fact which was emphasized in selling the service charge idea to the public in many played up newspaper releases. The Columbus ordinance requires that all properties benefitting from socalled free-water be metered and billed for sewerage service, yielding $22,000 annually otherwise uncollectible. Even the State of Ohio was paying for sewer service to all governmental buildings, including the capitol. And, even the State Department of Health was helping pay for the Columbus plant which it had so long hammered for.

W. F. TEMPEST, Engr., Portland Cement Ass'n, Chicago, Ill., spoke very much along the lines of his article **Sewerage Financing** in the January 1939 issue of this magazine. He stressed the importance of properly drawn publicity and securing adequate information for banking interests, *before* seeking sale of revenue bonds financed from sewer rental. In modern financing those most experienced were in general agreement that the most equitable distribution of costs should involve drawing capital costs from the general tax and operation and maintenance costs wholly from service charges—i.e., sewer rental. The trend in schedules was toward graduated scales in cents per thousand in parallel with metered water charges. In planning this type of financing, experience had indicated that simplicity in computing the service charge (for benefit of user and department personnel alike) had proved of paramount importance. Further, in billing along with water charges the two items should be shown separately. He commented that a real weakness was the fact that fundamentally uniform methods of charging and billing were lacking even in neighbor cities. Some thought should be given this question, as has been done in connection with other utility charges and billing.

Mr. Tempest cited Oak Park, Ill., as a city which had been successful in setting up a rental scheme devised to pay for the entire sewerage system. Thus, the Oak Park ordinance was rather different from most such

Sam L. Tolman, Supt., Ward's Island Plant (Cut his operating teeth in Chicago; on occasions grits them in New York.)

Wm. C. Hamm, Supt., Port Washington, L. I. (The "Dean of N. Y. Operators" has lived 22 years with Imhoff tanks.)

ordinances, and therefore had been reproduced along with billing forms in a new booklet on **Sewerage Financing** recently produced by the Portland Cement Association for distribution to all requesting a copy. Concerning collection enforcement, water shut off for non-payment was not a practical scheme and, therefore, laws making sewer charges a lien against properties served seemed to be the most universally satisfactory and effective method. Mr. Tempest closed by showing lantern slides of representative billing forms in use by large and small cities. These also are reproduced in the new booklet **Sewerage Financing.**

New York City Plants

First Year's Operation of the Ward's Island Treatment Plant by WELLINGTON DONALDSON, Director of Sewage Disposal, Dept. of Public Works, New York.

Mr. Donaldson in tones "sometimes glad—sometimes sad," reviewed operating experiences during the first year of operation of New York's new 180 m.g.d. (52 acre) activated sludge plant on Ward's Island in the East River. Amongst operating difficulties, the serious scum trouble on the primary tanks witnessed by last January's visitors, had been traced to air entrainment in the drop-leg of the deep syphon and at the pump suction. The air had buoyed the cominuted paper (pulp) and grease to the surface. Since correction the problem had essentially been solved. Sewers, not cleaned for many months, if not years, had disgorged their complement of grit, cinders and brick-bats, to embarrass grit chamber operations. The scheme of grit lifting to the washers by rotary type pumps had proved a failure and screw conveyors had replaced the pumps. One of the chief sources of difficulties had been the primary sludge pumps which had proved both inadequate and costly to maintain, and four additional pumps had been installed. The large Worthington crude sewage pumps had on the other hand given no trouble. A satisfactory scheme of concentrating excess activated sludge was proving to be highly important. Biological action, sludge swelling and gas lifting in those final tanks dedicated to service as sludge thickeners had proved a problem in these tanks which were not designed as thickeners. To overcome this difficulty copper-sulphate application had proved disappointing and at present top-water chlorination was being tried, as was mild chlorination of return sludge to

Long Way from Home!
Carl Beyer and Mrs. B. came all the way from San Francisco.

check sludge bulking. The three ship Sludge Fleet, costing almost $1,500,000 set down in the water, had proved costly because of the expense of taking out the dents resulting from minor harbor collisions.

Sludge disposal, never ceasing to prevent its problems and apparently

New York City's Newest
The Tallman's Island Treatment Works Nearing Completion—View from Power House toward Long Island Sound.

regardless of method, had produced an odor problem in connection with storage and tanker loading, such as ripening activated sludge can so successfully do. The solution involved draft fans sucking air downward through the storage tank building and discharge to a stack. Odors were being destroyed by the introduction of ozone into the stack. Ahead of the ozone treatment the air passes through a helpful chamber filled with cannisters of granular carbon. The odorous air discharging from the tankers, while taking on sludge cargo, was being passed through an annular chamber filled with cannisters of carbon. Such had proved very helpful if the rate of filling is not too rapid to allow a reasonable carbon contact period. The new scum incinerator, not originally contemplated, had been effectively employed to avoid the necessity of dumping floatable materials at sea. One of the chief operating difficulties at Ward's Island had been that of securing adequate complement of laborers for best routine operating practice, not to mention emergency conditions met with under such circumstances as the 3 hour power failure in the hurricane.

Some idea was had of the magnitude of the Ward's Island sludge disposal problem when Mr. Donaldson revealed that the 3 vessels had been kept busy taking to ocean dumping grounds 295,500,000 gallons of sludge in 1938, running from 2 to 5 per cent in solids content. Thus, was evident the importance of preliminary sludge thickening as an economic measure, in addition to the fact that sludge storage and sea shipping capacity had been the "bottle-neck" of the plant. In presenting operating statistics and cost records, Mr. Donaldson revealed average air input of 0.9 cu. ft./gal. of sewage treated, sludge recirculation of 35 per cent (volume) to maintain rapid return of solids to a supply of air. Total costs had averaged $13.00 per million, with a minimum of $10.20 per million realized in June 1938.

[Puzzling to some operators is the fact that 1300 parts of solids carried in the aeration units is about the maximum that can be maintained at Ward's Island without running into difficulties in respect to purification efficiency. While this constitutes more a "question" than a problem, the cause is being studied, with the thought of widening the limits of solids storage within the aeration units to permit greater operating flexibility.—Ed.]

Features of the New Tallmans Island Sewage Works of New York City by HENRY LIEBMANN, Designing Engr., and E. J. Fort, Project Engr., Dept. of Public Works, New York City.

This joint paper was interestingly presented in two parts by the authors. Mr. Liebman briefly described the several component units of the 40 m.g.d. activated sludge plant rushed to completion ahead of schedule (without Federal aid) to serve the area on the north-west point of Long Island, including the World's Fair area. Involved is sludge digestion and 100 per cent recovery of power by operating 8 gas engines (3500 H.P.) direct connected to 4 displacement (rotary) type blowers and 4 sewage pumps, the engines being subject to automatic speed variation by carburetor throttling to maintain balanced air-sewage ratios.

The Spiffy Power, Pump and Blower Station—Tallman's Island Plant of New York City
(Boasts 8 gas-engines, developing 3500 H.P., as the record by-product power development in American sewage plants.)

The engines, for this largest installation in America, were selected on the basis of successful experiences with three low speed Worthington units in the Coney Island plant, producing its entire power requirements so dependably as to justify cutting loose from the power company completely.

The spent (digested) sludge will be barged to sea. Automatically cleaned bar screens have no cross bars and facilities for screenings grinding are provided. Grit will be washed by plant effluent. Because of the location of the plant, in a beauty spot contiguous to a parkway system, architectural treatment and grounds beautification received especial attention.

At this point co-author Fort took over. He described the Venturi metering system, the 1 hour primary tanks with straight-line sludge collection and skimming mechanisms, sludge pumps with vari-speed drive for maximum flexibility. The aeration units (3.3 hrs. detention) are equipped with "Axolite" plates (40 porosity rating) set on rubber gaskets and held down with aluminum bolts. The final tanks, providing 2.5 hr. detention and area of 1000 gals./day/sq. ft., have exceptionally long weir take-off in the form of suspended troughs. Each final tank is equipped with a sludge blanket depth signal and alarm system, involving adaptation of submerged photo electric "eyes" which do not "see" when the sludge blanket becomes too deep and sounds a signal. To enhance economy in digester capacity (four units with Downes' floating covers) wasted activated sludge will be thickened in two Dorr tanks provided with picket-fence type thickening mechanisms. Chlorination of top-water is to be practiced to check biological activity, while concentrating sludge from 1 per cent solids input to roughly 5 per cent solids in the sludge output, pumped direct to the digesters. No activated sludge will be sent back to settle in the primary units.

Interesting was the fact that only a small gas storage tank had been provided in addition to the storage under the floating covers. The reason is that some auxiliary gas will have to be drawn from the gas company's mains to maintain all 8 engines in continuous operation. Therefore the gas company's system will be "floating" on the sludge gas system and automatically bleed in when gas production is not apace with engine demand. Supernatant liquor may be taken off at four depths through safety-insuring closed compartments. It will be aerated, heavily chlorinated and coagulated before passing through a clarification unit providing a 6 hour settling period. The clarifying tank will serve to prime and flush the sludge pumps. Its sludge will be returned to the digesters and its clear liquor to the primary clarifiers. Digested sludge flows by gravity to fill the sludge vessels taking it to sea.

The project complete cost $3,833,000 of which $71,900 was provided for landscaping and beautification.

The next day members saw this plant with its extraordinary power station (an outstanding feature), and 140 electric motors (760 H.P.) required to drive auxiliary equipment and serve as stand-by units.

Leak Repair with Babbitt

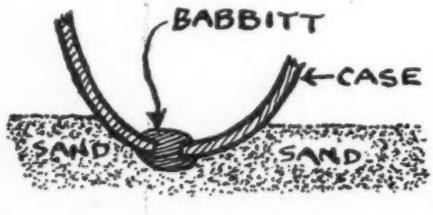
A Kink by W. F. Schaphorst, M.E., Newark, N. J.

This sketch shows a method I have successfully used for closing holes in castings by means of babbit metal, and at the same time maintaining water tightness under reasonable pressure. It is quicker than any other method I have encountered.

Simply place the broken part in a box of sand, as illustrated. Push away enough of the sand from the edge of the hole so that the babbitt will securely clamp around both sides. You are then ready for the pouring of the babbitt.

Pouring babbitt is such a simple process that I feel I need not describe it here.

Welding, of course, is better. But for temporary work this babbitt method serves the purpose very well. In fact, one of my babbitt repair jobs, performed more than 20 years ago, is still good.



Section of Repaired Leak

If you have no babbitt, use lead or similar metal having a low melting point.

New Giant Size Pumps for Chicago Sanitary District

The record size double suction pumps now under construction for the Chicago Sanitary District require giant, 14,000-pound revolving elements. These stand five and one-half feet high and measure six and one-half feet in diameter (see picture). Each pump will deliver 168,730 gals. of sewage per minute at 138.4 revolutions per minute against a head of 19½ feet. The accompanying picture was made in the Allis-Chalmers plant at Milwaukee during the process of finishing the impeller of one of the four "giants" now in production.

Finishing an Impeller

"Financing Sewage Works"

(A Review)

A booklet of 22 pages, just issued by the Portland Cement Association, presents four methods employed in financing sewerage systems and sewage treatment plants, and outlines the proper and effective procedure to be followed in successful financing—the legal, the educational and popularization, and the financial phases. Emphasizing the "revenue bond—service charge" method, as basically the soundest scheme, typical ordinances enabling such method are presented—also are typical billing forms used, etc. Sewer rental methods, and experiences therewith, are revealed in easily compared tabulated form.

"Financing Sewage Works" (no charge) may be had by request to the Portland Cement Association, 33 West Grand Ave., Chicago, Ill.

SOME EXPERIENCES IN STOPPING LEAKS WATER AND DOLLARS

In Which Scientific Inspections and Battery Meters Prove Their Worth

By FRANK J. BROZ,
Superintendent
Cicero Water Bureau
Cicero, Illinois

THE present day executive of a water department is greatly interested in how he can account and get paid for the largest possible percentage of water distributed. Particularly is this so when water is purchased wholesale for retail distribution to metered customers.

Cicero purchases its water from the city of Chicago. Its supply is metered to us by Chicago at the city limits through a battery of ten 12-inch velocity meters. Therefore, the necessity of accounting for the water used in Cicero is of more than ordinary importance.

Cicero employs the following methods to account for the water it purchases:

First—A permanent underground leakage survey is maintained.

Second — Periodic plumbing inspections are conducted in all residential and commercial properties.

Third—By keeping all of our 14,000 meters, both large and small, in good operating condition.

Fourth—By paying attention to the installation of proper sizes and types of meters.

Fifth—By using the battery system of disc meters, instead of compound meters.

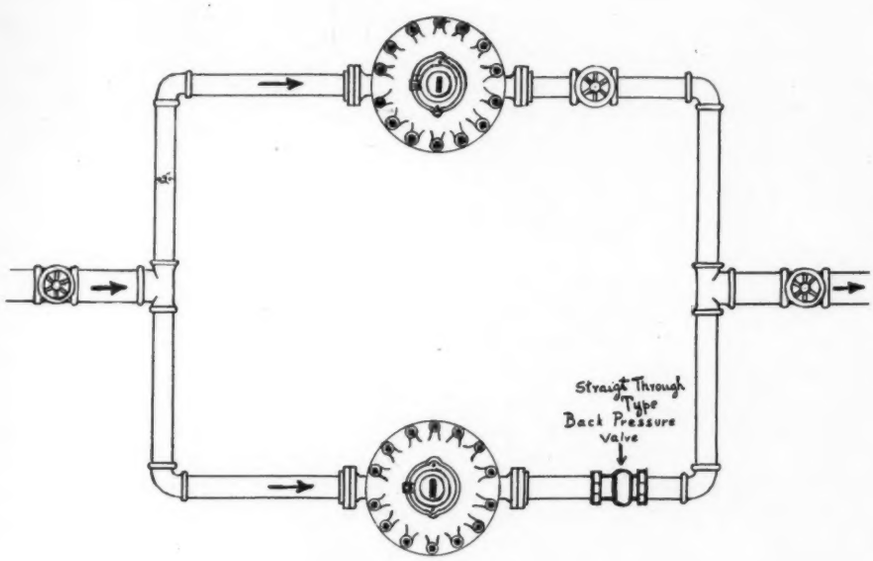


Fig. 1—Normal Scheme of Battery Meter Installations

[Shows installation of 2-inch disc-meters for 3 and 4-inch supply lines. On the 6 and 8-inch lines, 3 or more can be used. The back pressure valve diverts the small flows to one meter in the battery.]

Sixth—By inspection and accuracy control of meters on all monthly accounts, and on all meters in sizes one inch and up.

Seventh—By periodic testing of the five-eighths-inch to one and one-half-inch sized meters, and annual testing of meters in sizes two inches and up.

Eighth—By repairing meters in the proper manner so as to insure accuracy on small rates of flow.

Ninth — By control of fire-line service by metering each.

An explanation of the methods listed above is as follows: Our underground leakage surveys are made by districts, the town being divided into eight major districts. Measurements are taken in each district and the underground leaks are located by our crews. The weak sections are watched very carefully the year round.

Consumer Waste Correction

Investigations during the past three years developed that property and plumbing leakage amounts to almost 2,000,000 gallons per day in Cicero. Two plumbers are employed to continually inspect properties upon consumer complaints. In addition, inspections are made *before* complaints are received whenever our meter readings show sudden increases in consumption—an important consideration in maintaining good consumer relations.

Cicero's population is cosmopolitan in its makeup, with a great many foreign-born residents, and it has been rather difficult to get these people to understand that waste of water on their properties means a waste of money.

At first this problem was attacked by sending out literature with the water bill, but in the majority of the cases the pamphlets were never taken out of the envelopes. Since we have employed the plumbers we have found that this personal contact method is the best, and pays dividends both in water saved and in satisfied consumers.

We have found that back-billing a consumer for a period during which the meter was not in operation, brought about many misunderstandings and loss of revenue. Consequently it has been the aim of the

Cicero Bureau of Water to keep *all* meters operating.

Selection of Meter Size Important

The proper size and type of meter is determined by the use of a recording register which gives the maximum and minimum gallon demand on the service in question. Our latest method calls for a periodical test of ⅝-inch to 1½-inch sizes, inclusive, every five years; or, in less time if the consumption reaches a point where the meters should be removed for inspection, repair and test. We are guided by a chart showing the maximum yearly registration allowable in all size meters, as well as a chart showing the cumulative registration at which meters should be removed for inspection, repair and test.

Meters of 2-inch size and up are tested annually. We employ two men specially trained to keep all meters on the monthly account basis as nearly as possible to the 100% mark. Our difficulties with the small meters in sizes ⅝-inch to 2-inch have been minor in comparison to those of 3-inch sizes and up.

The method used in controlling the larger services is in the adoption of the battery system of disc meters as herein illustrated in figures 1 and 2.

First—We ascertain as nearly as possible the contemplated demand of the service to be metered.

Second—We install one or more disc-type meters on such services.

Third — We install a recording register on the meter or meters installed. This procedure gives us the important gallons per minute demand curve.

Fourth — When we have determined the gallons per minute demand we make a permanent battery installation of disc-meters on such service.

Fifth — We use a back-pressure valve set at 3 pounds on the outlet of all meters in the battery except *one* meter. This method diverts the very small flows to just one meter in the battery and a more accurate registration results.

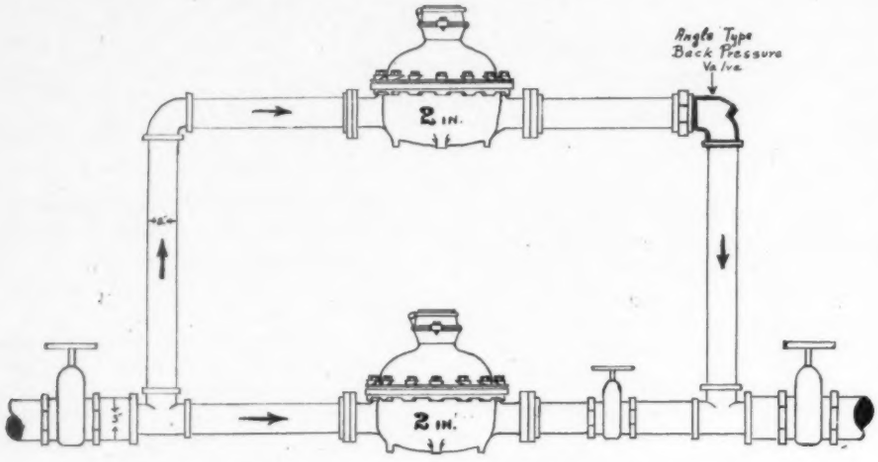


Fig. 2—An Alternate Scheme of Battery Meter Installation
[Shows 2-inch disc-meters in tier formation, where preferable or where space Limitations dictate.]

From our experience the battery scheme is the best, most accurate, and cheapest method of measuring most nearly 100% of the water used through important services—i.e., those of sizes above three inches.

Correcting Compound Meter Inaccuracy

Another problem which we have solved is the inaccuracy of compound meters in three-inch size and up, which occurs chiefly at the change-over point from the disc to the velocity type meter. For example, in a three-inch compound meter the change-over point is from 18 to 25 gallons per minute. The velocity meter section is not accurate at the rate of flow. Consequently we had a loss in revenue at the change-over point.

How we solved the problem is shown in figure 3. We place a by-pass of one-inch size around the compound meter and insert a one-inch meter therein. By this method we have been able to retain many of our 3, 4 and 6-inch compounds in service. And we take some pleasure in saying, with a noticeable increase in revenue resulting. The secret lies in the fact that we simply raised the change-over point in gallons per minute to a higher figure, at which rate the velocity meter proved considerably more accurate.

Value of the Recording Meter

We have now reached the point where we have studied, and more fully understand, our most important individual services in respect to demand rates and type of metering most effective in revenue production —i.e., accuracy of measuring consumption. This has been accomplished by the use of the recording register and study of the charts. Without such a device we would still be working in the dark. The results that we have obtained in changing and bettering our methods of metering is well shown in the following table.

Percent Water Unaccounted For	
1931	42%
1932	46%
1934	41.5%
1935	34%
1936	32%
1937	20%

The men in charge of meter repairs have had special training in their work and no meter leaves the

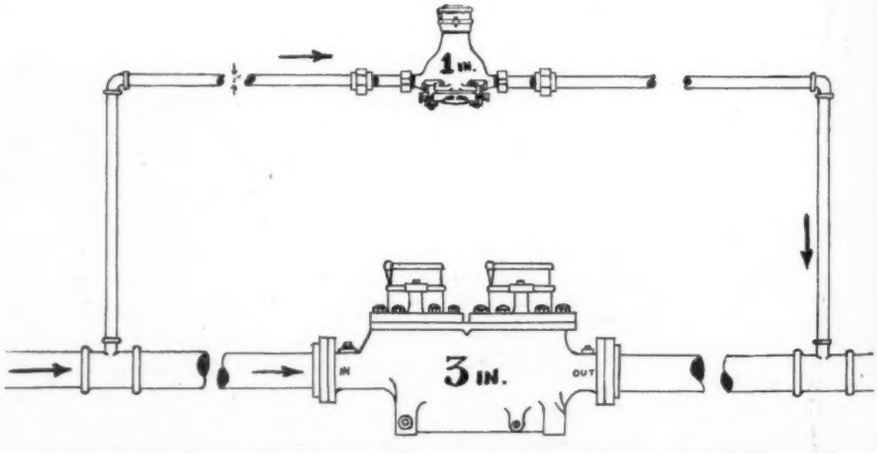


Fig. 3—Scheme for Improving Accuracy of Compound Meters
[The change over point to the velocity meter is raised to a higher rate of flow. A one-inch metered bypass makes such a change permissible, with higher percentage registration realized over the range of original change over flow rates.]

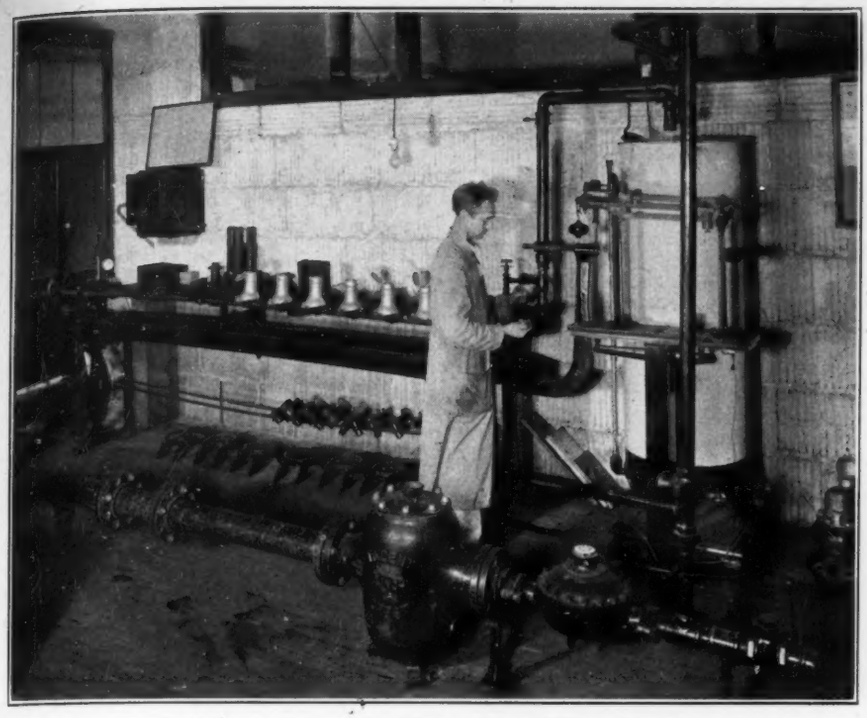


Fig. 4—Cicero's Meter Test Equipment

[Capable of testing 8 ⅝-in., or 7 ¾-in., or 6 1-in., or 4 1½-in., or 3 2-in. meters at a time, this arrangement has cut down our cost of testing considerably.] Our test requirements are as follows: On ⅝-in. repaired meters—within 98.5 to 101.5 on rates of flow of 10, 6, 4, 2, 1 and ½ gallons per minute, 90% or better on ¼ gallon per minute. Calibrated glass funnels are used on the 1, ½ and ¼ gallon per minute flows. The low flow requirements on ¾ and 1-in. is ½ gallon per minute; the 1½-in. is ¾ gallon per minute; and the 2-in. size, 95% or better on 1 gallon per minute.

department until it has met or bettered the American Water Works Association standard tests for accuracy and performance. These we all know are much too liberal.

Figure 4 pictures the type of testing equipment in use in the Town of Cicero, with which we are able to test all meters up to the 6-inch size. In conclusion, Cicero has found that three things are necessary to successfully operate its department.

First—Eliminate leakage in mains, services, and plumbing.

Second—Keep our meters as near 100% accurate as possible.

Third—Employ the battery system of metering all services three inches and larger as far as may be permissible.

THE HIGH COST OF POOR PACKING

Selecting the Right Packing; Figuring the Power Loss

By W. F. SCHAPHORST, M.E.
Newark, N. J.

I HAVE a letter from the Water Works Division of the city of Lorain, Ohio, in which the Chief Engineer writes that the packing on an 8 million gallon centrifugal pump has given seven years of continuous service. He says it is the best packing he has ever used.

Users of packing on water supply machinery know that it is one of the many things that cause a certain amount of trouble, especially when it must be removed, or when the shaft or rod must be turned down smooth on account of scoring. Otherwise, it is seldom given a thought and the same kind of packing is frequently used over and over, often at a considerable money loss. A simple test can easily be made to determine the friction of a given packing in order to compare it with the friction of any other. This test, of course, should be made on a new and unscored shaft.

Selecting the Right Packing

First, pack the stuffing box of a centrifugal pump, say, with packing No. 1, just tight enough so that there is no leakage. Then disconnect from the motor or engine, and rig up a crank of some kind so that the shaft can be turned by hand. This crank must have a measured distance, in inches, from the center of the shaft to the point of application of the pull necessary to revolve the shaft. The direction of pull must always be at right angles with the crank arm. Rotate the shaft slowly, and by means of a pair of spring balances determine the pull required, as closely as possible, in pounds. Experiment with it until you are sure you have the correct number of pounds, and make a note of it so as not to forget.

Next, do the same thing with packing No. 2. Invariably one packing will cause more friction than the other. The packing that creates the least friction, to be sure, is the most desirable. This test can be continued from time to time until the packing of minimum resistance is found. Subtract the minimum pull from the maximum, both of which should be in pounds; multiply by the length of the crank arm in inches, then by the number of revolutions made per minute by the pump, and divide the product by 63,100. *The answer is the horsepower loss due to poor packing.*

Figure the Yearly Loss

Let us say, for example, that the pull with packing No. 1 (in place) is 10 pounds, and with packing No. 2 it is 4 pounds. The difference, therefore, is 6 pounds. If the length of the crank arm is 12 inches and the revolutions per minute of the pump are 600, we have:

$$\frac{6 \times 12 \times 600}{63{,}100} = 0.685 \text{ h.p. loss.}$$

Continual loss of this much power, because of poor packing, is quite an item. Perhaps you are losing more than this, perhaps not as much. At least, it is a test that is worth trying if you are dissatisfied with your present packing and wish to determine whether or not it will pay you to purchase a kind that may be more expensive but claimed to be much better. This can be figured on the basis of the cost of a horsepower per year. Thus, if a horsepower per year costs you approximately $50, the cost of power lost in the above example due to poor packing would be $50 × 0.685 = $34.30. It is plain, then, that a considerable money loss may lurk in your packing methods year in and year out. Buy the kind that seals effectively and at the same time causes the least friction drag.

REHABILITATION OF OLD BRICK SEWER

By HENRY A. NELSON
Commissioner of Public Works,
Racine, Wis.

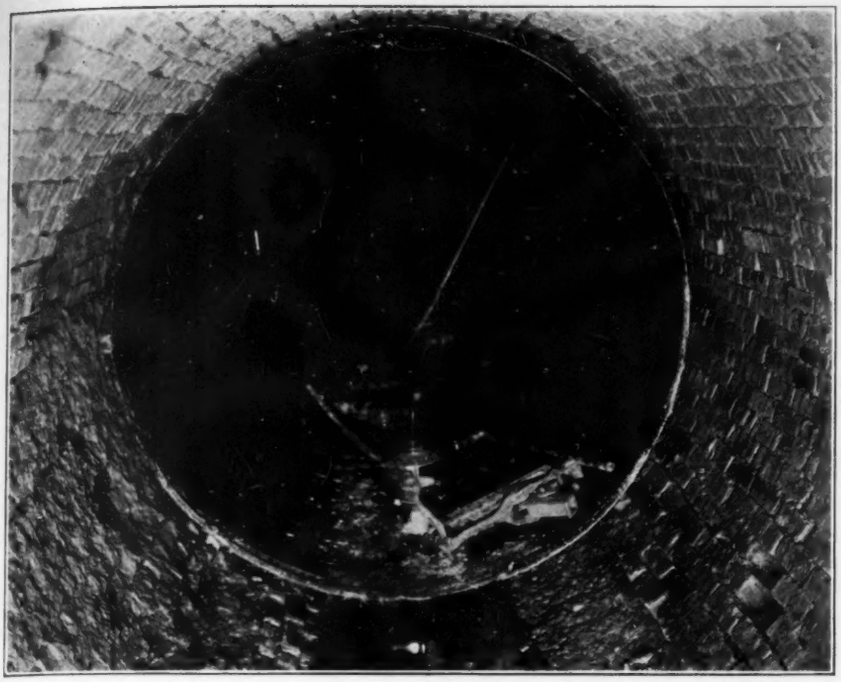
Wherein Racine's Failing Outfall Sewer Is Relined With Paved Corrugated Pipe at Substantial Saving

DURING the past year the city of Racine, Wisconsin, found it was necessary to repair or rebuild approximately 600 lineal feet of 78-inch brick outfall sewer. This sewer, known as the Cedar Bend Sewer, had been built about 25 years ago as a combined sewer to serve a large area in the western part of the city. In 1930 an intercepting sewer was built to carry the dry weather flow of the brick sewer which was subsequently used only as an overflow sewer during storms. The place where the intercepting connection was made was the upper end of the present repair work.

In 1933 during several heavy storms a large block of concrete at the outfall end of the brick sewer became undermined with resultant settling of the concrete block. This caused cracking and gradual disintegration of the sewer at this point. Several plans were made for repairing the sewer, but for various reasons no work was done. Finally, in 1937 the situation became acute and the intercepting sewer built in 1930 was threatened with failure by erosion of the river bank.

After the separation, Cedar Bend outfall became cold and the effects

A Good Picture of the 72-in. Paved Insert Armco Pipe Being "Threaded" Into the Disintegrating Brick Outfall.



A Corrugated Pipe in Place
Note the close fit between old sewer walls and liner pipe. In addition, the very bad condition of the brick is clearly pictured.

of the changes of temperature were to loosen and dislodge the brick, the cement bond of which had been eaten away by acid produced by sewer gases, sewage action and erosion. The erosion was particularly noticeable at the invert. The combined effects after several years were so alarming that a thorough inspection in the fall of 1937 disclosed that the sewer would have to be rebuilt or completely repaired from 12th St. to the outlet, a distance of approximately 600 feet.

The cost of rebuilding was conservatively estimated at $45.00 per foot, in that the sewer was in part under 12th St. (its top being 4 to 8 feet below surface), and its course from the street to the river was under two fairways of Washington Park Municipal Golf Course.

Selection of Repair Method

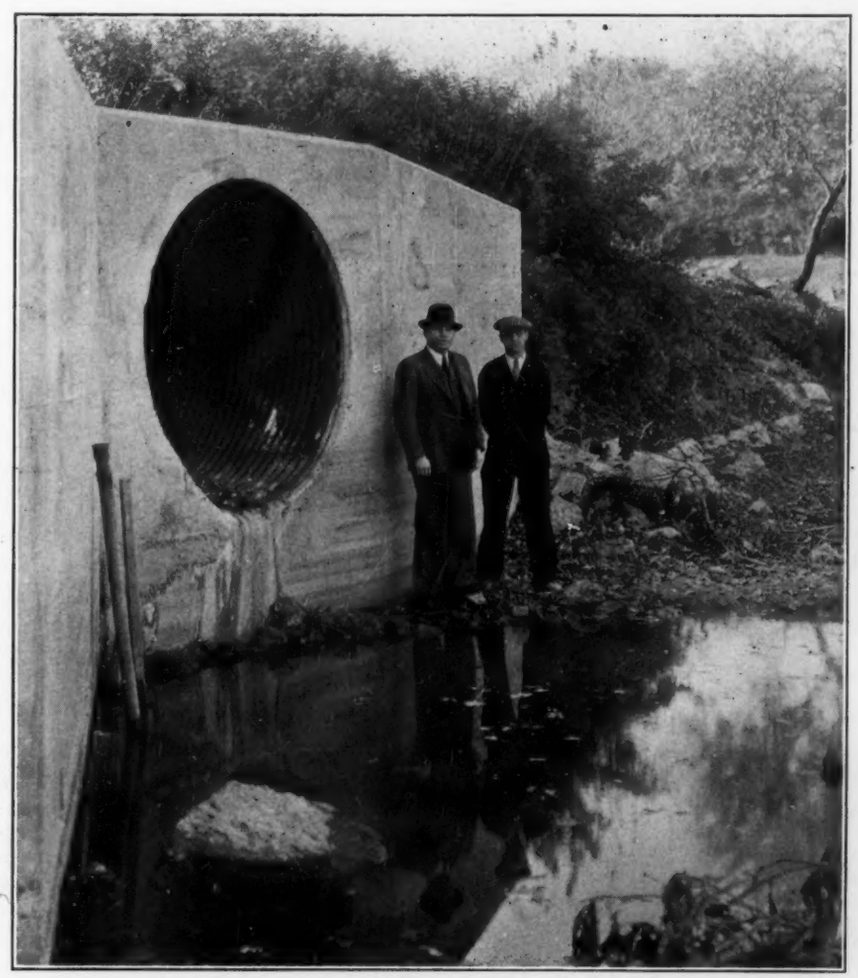
After a thorough consideration of various methods of repair, the city decided to reline the sewer with 72-inch corrugated metal pipe by the threading process. The specifications called for relining with Armco Asbestos-Bonded Paved Invert Pipe, with complete asphalt coat on the outside. Bids were received and the project was awarded to the low bidder. The Drainage Engineering Company of Middletown, Ohio, at a substantial saving in cost to the city over other methods considered.

Something of the Method

The method of construction was to insert the corrugated pipe in lengths of 12 to 20 feet into the outfall end of the sewer. By means of a carrying cradle (or sled) and a winch erected over a manhole at the upper end of the work, the sections of pipe were hauled into position in the sewer. Special asphalt-coated couplings (connecting bands) were used to connect the sections inside the sewer. Each joint was retreated with asphalt to insure watertightness. A concrete headwall was placed to prevent scour at the outfall end.

To fill the space between the old sewer and the corrugated liner pipe, a mixture of sand and cement was blown in under air pressure of around 125 pounds. The material was admitted through holes 4 inches in diameter sunk from the surface of the ground to the top of the old brick sewer. The operation and equipment occupied but a small space on the surface, and in no way impaired the use of the golf course during operations.

Pictures accompanying this article show the site of the project with the undermined outfall, the method of inserting or threading the corru-



The Job Completed—Successfully, Economically.
(Nearest the camera is the author; on his left Wm. Chadwick, Ass't City Engr.)

gated pipe into the old sewer, the eroded invert and ravelled condition of the old brick sewer, with the cement mortar eaten from between the bricks, the fit of the 72-inch corrugated pipe into the old section, and the outfall end of the completed job.

The resultant loss in cross-sectional area between the new 72-inch and the old 78-inch opening was not of serious import in that the remaining area is calculated to be more than ample after the separation of the sanitary sewerage.

Costs

The cost of the work, which was less than half of the cost of rebuilding, was both pleasing and revealing to the city. The work was carried on with little or no interference with street traffic, or the use of the golf course. The method of construction is believed by the writer to be the simplest, most feasible; and, equally important, it proved the safest method by which he has ever attempted to do sewer repair work. The city of Racine also feels that with the excellent service record of Armco Ingot Iron in sewers scattered over the country, and the added protection of the asbestos-bonded paved invert, that the relined sewer will give satisfactory service for many years to come.

The men in charge of the work consisted of the writer as commissioner of public works, William Chadwick, assistant city engineer, and C. H. Anderson, superintendent for The Drainage Engineering Company, contractor.

Revised Program of A. S. A. Committee on Plumbing Standardization

The American Standards Association Committee A-40 which concerns itself with standardization of plumbing practices, design and equipment, is to undergo a needed reorganization.

In the future "Plumbing Standardization" will be studied and developed as two separate projects with the intent of securing the two most appropriate organizations to sponsor the projects separately.

The American Society of Mechanical Engineers has agreed to sponsor that portion of the program (project) which will involve studies of plumbing materials and dimensions. The American Public Health Association has been selected as the most appropriate organization to sponsor that portion of the program (project) which will involve minimum requirements for safety and health (design, performance and maintenance), and the drawing up of plumbing codes that will insure safety to public health.

Both the American Water Works Association and the Association of Master Plumbers are to participate in developing and prosecuting the new program.

$100,000 Research Program on Welding

A $100,000 program of welding research will be carried out in 1939 by the Welding Research Committee of the Engineering Foundation, 29 West 39th St., New York, N. Y.

The research is coordinated by the committee, in cooperation with leading scientific talent in the field. And Mr. William Spraragen, its technical secretary, states that more than seventy individual projects are in progress in universities throughout the nation.

W. Zode Smith Has Served Atlanta Water Works Almost Half Century

W. Zode Smith, General Manager of the Atlanta Water Works, received newspaper reporters in his office recently to tell them something of the history of the local water works. It developed that he was in his 50th year of continuous service

"Buddies"
Zode Smith, Gen'l Mgr.
Bill Rapp, Supt., Distribution,
Atlanta, Ga.

with the City of Atlanta. To look at Mr. Smith one would conclude that he must have started as "water-boy." He says not; he commenced as a meter reader, and has seen 4,000 Atlanta connections grow to 60,000 and consumption from 3,000,000 to 35,000,000 gallons per day. Twenty-eight years ago he was made General Manager.

R. A. North Passes

R. A. North, president and general manager of the Green Bay Foundry and Machine Works, Green Bay, Wisconsin, died on January 19th at his Green Bay home. He was in his 67th year.

Fifteen years ago Mr. North founded the Green Bay Foundry and Machine Works and became best known for his inventions in the pulp and paper making field and the equipment supplied the industry. In the sewage and industrial waste field the North Revolving Drum screen employed in sewage and, more recently, in water treatment has become his best known invention.

Mr. North is survived by his widow and a son, James P. North, vice-president and sales manager of the company.

Malcolm Pirnie Takes Over Practice of C. M. Everett

Announcement has been received from Chester M. Everett, Consulting Engineer, formerly a partner of Alan Hazen, that he is closing his offices in New York City.

Malcolm Pirnie, Consulting Engineer, also formerly a partner of Alan Hazen, will take over all records, plans and specifications of Mr. Everett at his offices at 25 West 43rd Street, New York City.

Mr. Pirnie announces that Mr. Everett will, henceforth, be available for consultation by special appointment through the Pirnie offices.

Gould, Donaldson and Kass Moved Up

With the year end, Richard Gould was promoted from Chief Engineer to Acting Deputy Commissioner of Public Works of New York City—in charge of sewerage and sewage disposal. At the same time Wellington Donaldson was made Director of the Bureau of Sewage Disposal, and Acting Chief Engineer—in charge of design, construction and operation of sewage works. And, Nathan Kass succeeds Mr. Donaldson as Operations Engineer, in charge of sewage plants.

Irving V. A. Hine has succeeded General Markham (resigned) as the new Commissioner of Public Works of New York City.

ONE OLD AND TWO NEW

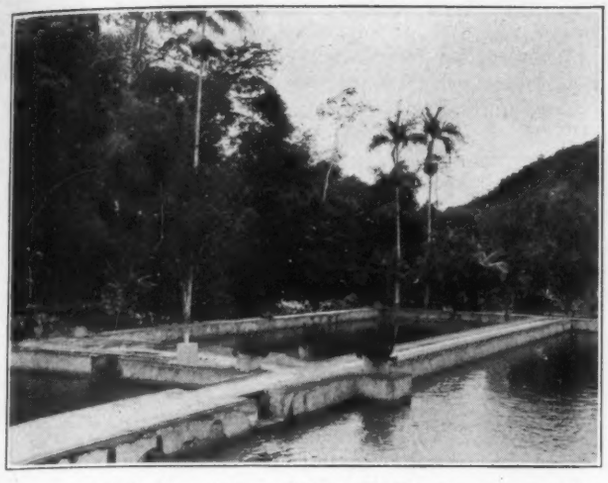


Photo by courtesy of Dana E. Kepner, Denver, Colo.

Few Settling Basins Can Boast Longer Service

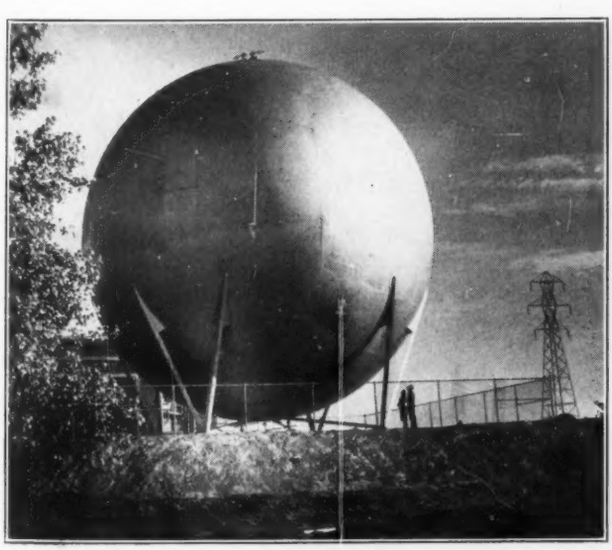
These are the venerable settling basins at the Municipal Water Works of Kingston, Jamaica. They are nearly 70 years old and still in use.

Artistry in Utility

Somehow there is romance in the recovery of power as a by-product from disposal of sewage and, in addition, a by-product of a by-product—namely, heat from the exhaust gases of the power-generating gas engines.

Now, we find added to such romance—artistry; first, in the "bubbles of progress" which are being built to store sludge gas most economically at treatment plants; second, in the artistry of the photographing of such spheres as here illustrated.

Aside from romance and artistry we learn that there is an underlying scientific basis for the "bubble" design of the holder which floats on the gas line. Under internal or external pressure like the bubbles of Nature, formed by natural surface tension, the spherical shell has uniform stresses in every part. The plates are carefully cut out, trimmed and shaped before delivery for erection —and, therein, is a secret of the steel plate "tailors," whose patterns must be laid out with engineering exactness. Joints are butt-welded from both sides, the electric arc-weld process being used.



The Cleveland Bubble

This particular holder is one of two serving Cleveland's new sewage treatment plants. It is 57½ ft. in diameter and has a capacity of 200,000 cu. ft. of gas, at an operating pressure of 29 pounds. Into this extremely flexible reservoir is automatically pumped all gas above that required at the time of its generation in the sludge digesters.

Engineers on the projects are Geo. B. Gascoigne & Associates of Cleveland. The "bubble" was fabricated by the Chicago Bridge and Iron Company, employing the "Fleetweld" shielded-arc process of The Lincoln Electric Co. of Cleveland, to whom we are indebted for the artistic photograph above.

Hammond's New Tank

Hammond, Indiana, continues to strengthen its water supply system, which only recently boasted a new 20 m.g.d. filtration plant and pumping station and intake betterments as important steps in a major program.

The latest improvement is the addition of the 1,500,000 gallon elevated tank of Colonial design here pictured. This tank, located on the far end of the system, 7½ miles from the filter plant, materially strengthens the system. It produces more even and dependable service pressures, better fire protection, and makes for less head at the pumping station; and, lowered pumping costs to maintain adequate service pressures. The bottom of this tank is 60 ft. above ground and the range in head is 35 feet—full to empty. It was installed under the direction of Mr. Leo Besozzi, Supervising Engineer of Hammond's Water Department.

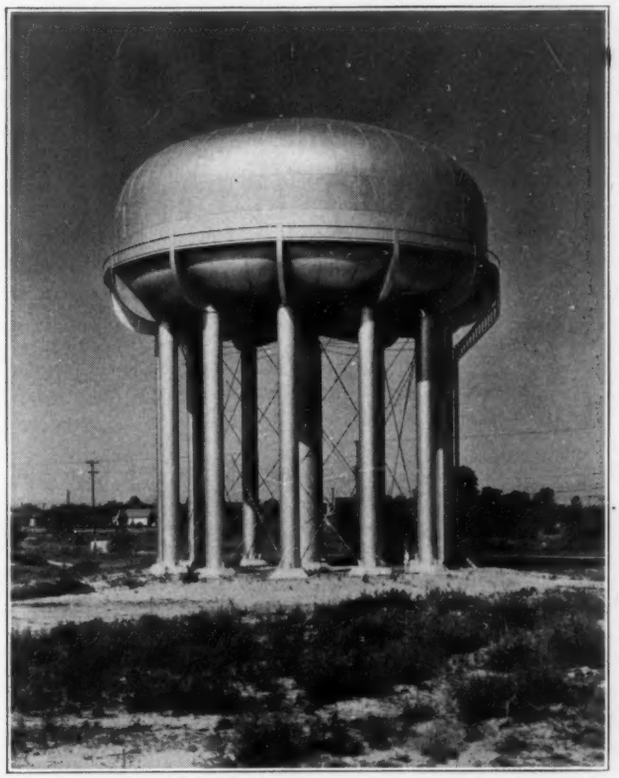


Photo by courtesy of M. E. Smith, Chicago Bridge & Iron Co.

A 1½ Million Gallon Improvement

The Editor's Comments

FRIENDS IN NEED

ONE very tangible worth of a water works association to its members was plainly revealed during a recent meeting of the Maine Water Utilities Association. Members heard of the tough spot that a fellow member found himself in on Christmas Day, and how he and his men spent the week between Christmas and New Year's Day endeavoring to get out of this spot. Maurice A. Libby, superintendent of the Water District of Bath, Maine, was the unlucky member. His troubles started when a loss of pressure and diminishing water level in the reservoir was traced to an open joint in the submarine section of the main supply line crossing the Kennebec River. A ship's anchor had apparently caught in the line and pulled it out of its trench, opening one of the leaded bell and spigot joints.

About the time that all seemed arranged for making the repair an iceflow broke loose upstream and descending on the scows not only wrecked the attempt and equipment but did added damage to the pipe line. A second attempt, made under the same conditions of ice flow hazards again came to grief, with everything being taken down stream.

With the first calamity it became apparent to Mr. Libby that the spot he was in was getting tougher and tougher—that an auxiliary supply, for the section of the city supplied through the submarine main, had to be secured. For the purpose he needed considerable equipment in a hurry—and, it was Christmas week. Here is where Supt. Libby needed friends—and, he found that he had them. In fact they who heard of his plight were not alone friends in need, ready to help a fellow superintendent in trouble all that they could,—they were Maurice Libby's buddies.

Why buddies? Well that's the kernel of this story. In the Maine Water Utilities Association there exists just that sort of spirit. More than that, the water superintendents along the Kennebec have established a fraternity of The Three Musketeers variety, with a motto similar to that of the famed three. The "Order of the Kennebec" is known in the association as "The Catamounts of the Kennebec Valley." In play, they are a bunch of "Indians"—the "Shrine" of the Maine Water Utilities Association. In trouble, the word of the famed motto becomes fact—*"One for All; All for One!"*

In his emergency when Supt. Libby needed a sleeve, or other parts, a 'phone call to brother Catamounts of the valley was all that was necessary to get the needed material or equipment on the job in quick order. If one brother didn't have the needed fitting or part, he usually knew of another that did. If he didn't then he got on the 'phone to help locate it and report back to brother Libby when found.

Not only did the needed parts travel in double-quick time, but with them, came brother superintendents to offer whatever assistance might be possible, and to give brother Libby that moral support so helpful when one finds himself out on a limb, the half of which is not visualized in these paragraphs. Now, with the job completed, and inspected by Supt. Libby in a divers suit at the bottom, out of this experience is to come a parallel main across the river at Bath—this one, however, to boast bolted mechanical joints of the flexible ball and socket type, which withstand 12 degrees of deflection and can not be pulled apart.

In this story there is exceptional evidence of the worth of water works associations, the justification of attending meetings, the value of knowing and fraternizing with neighbor members. In addition there springs from it "a thought for the day." This thought is that neighbor superintendents might well set up district protective emergency associations, in which one member might undertake to carry in stock certain parts and equipment that may likely be required in emergencies and other members certain other parts. In this manner it will not be necessary for each to maintain a complete line of emergency equipment, knowing that within reach will be available a full complement of such equipment.

MODERN LEAK LOCATION

ELSEWHERE in this issue, City Manager P. A. Goodwyn relates two interesting experiences in locating important main leakage in Bristol, Virginia.

The important aspect of these experiences is that a sizeable leakage from certain sections of Bristol's pipe system had been known to exist for sometime, but locating the exact spot of the leakage had been attempted from time to time without success. Pitometer surveys had shown that a total of 200,000 gallons of water were disappearing from the mains every day. That these were truly hidden leaks was evidenced by the failure to spot the points of leakage by methods at the time known to the Bristol authorities, even on repeated attempts.

Now the value of modern methods and equipment in water works practice has been nowhere more effectively demonstrated than in Bristol. The leaks were large and were deep. The water was quietly finding its way into underground caverns with which the limestone region of Bristol and many other sections is honeycombed; the authorities were baffled and concerned over the loss of dollars, day in and day out. Then, one day, a "peddler" (in New England they are "Ambassadors of Commerce") turned up in town with a "magic box," which he said was a radio leak-detector. It was new, and sounded complicated to City Manager Goodwyn; also, appeared to be rather an expensive piece of equipment for a water department the size of Bristol's. But, City Manager Goodwyn listened intently, thought of the taxpayers' dollars going daily to waste, wondered if the "magic box" in the visitor's hands would possibly locate the long hidden leaks. In the words of Mr. Goodwyn, he was very skeptical, but decided that this new machine should be given a trial on a demonstration basis—"admittedly with very little feeling that anything worthwhile would be accomplished." Then, on this tough assignment, much to the amazement and delight of all concerned, the "miracle" was successfully performed with the stranger's "magic box."

With this modern piece of leak-locating equipment both of the long hidden leaks of 100,000 gallons daily each (one fifteen feet below surface) were successfully spotted within 18 inches of the point indicated by the instruments, and Bristol's "friend in need" had made good his claims for the "magic box"—likewise a sale.

The important picture that comes from this story is, that even though the newer equipment in the water and sewage fields may seem costly or intricate, a trial may well reveal that the investment is amply justified, even for the smaller systems.

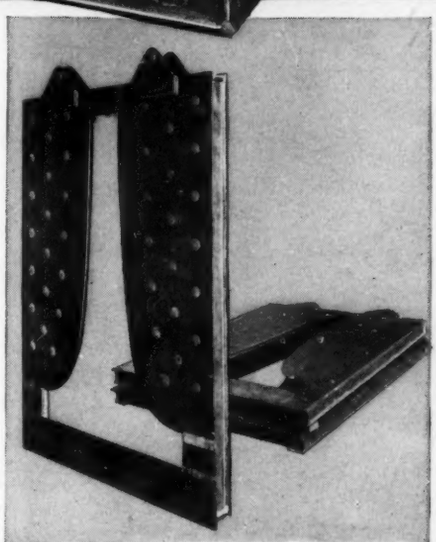
Non-Rust Everdur Metal for these 4 Weirs

Proportional weirs for Tallman's Island project are built to resist corrosion—made entirely of EVERDUR Copper-Silicon Alloy

Because of its proven dependability in sewage treatment service, Everdur Metal was selected for the proportional weirs at the outlets of each of the four grit chamber channels in the Tallman's Island Sewage Treatment Works of the City of New York.

The weirs regulate the flow between certain limits of velocity, thus securing uniform grit precipitation. Following the general coefficients as developed for the Sutro Weirs, these are of box construction, entirely continuous-seam welded with Everdur rod. Frame plates are held rigid with 1″ Everdur staybolts welded in place. Each weir is 5′ wide, 6′ 9″ high, and weighs 1500 lbs.

Outstanding is Everdur's adaptability to light-weight, wrought built-up structures. This Anaconda Alloy combines high strength with uniformly excellent resistance to corrosion. It is economical to use, for it is readily workable either hot or cold, and can be welded by commonly-used methods. Anaconda Publication E-11 sent on request.



Four Everdur proportional weirs designed and furnished by Krajewski-Pesant Mfg. Corp., New York, for the Tallman's Island Sewage Treatment Works of the City of New York. Caye Construction Company, Brooklyn, General Contractors. 39146

ANACONDA from mine to consumer

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Visit the Copper and Brass Industry Exhibit in the Metals Building, New York World's Fair—1939.

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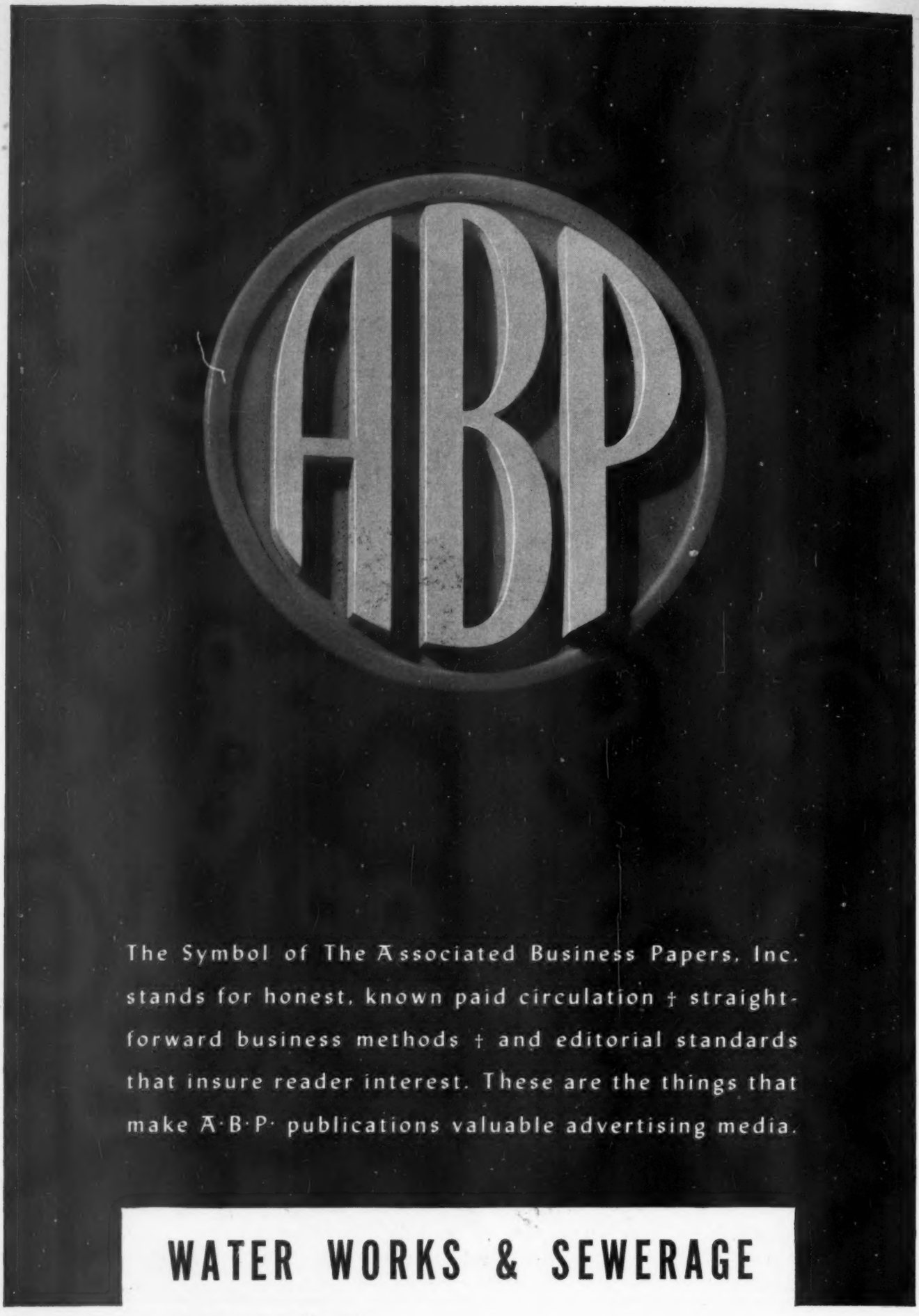
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WATER WORKS & SEWERAGE

EQUIPMENT NEWS

New Instrument for Open Channel Metering

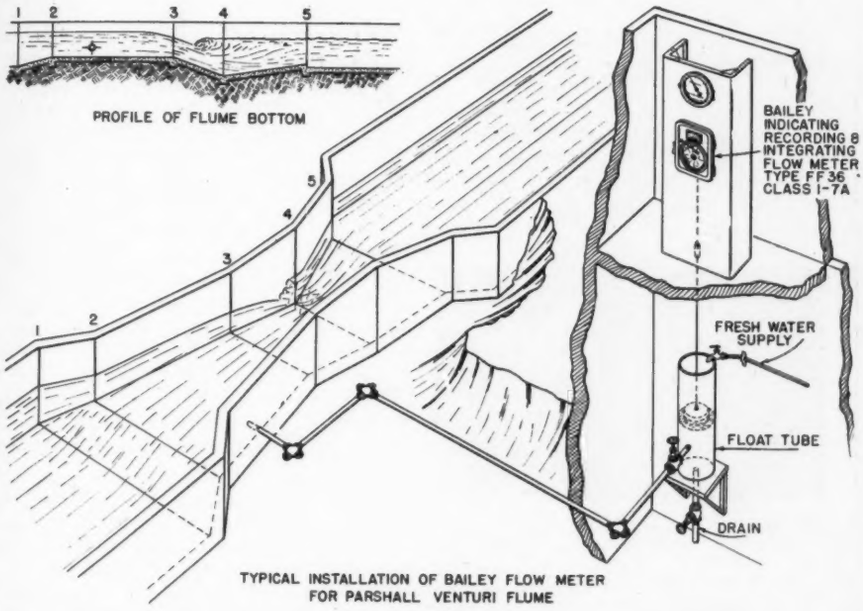
● A new meter for measuring the flow of liquids through open channels by the use of a Weir Notch or Venturi Flume has been developed by Bailey Meter Company, Cleveland, Ohio.

Especially developed for use in the water supply sewage treatment fields, this meter is of simple and sturdy design. Basically, the register is a float-operated device with the float motion transmitted to the indicating or recording system through a cable, sheave, gear, and cam mechanism with sensitive operating characteristics. By varying the shape of the cam and installing the proper gears, it is possible to use this register with weir notches of all types, and with the Venturi type Parshall Flume, which is rapidly becoming a very popular open channel primary metering element.

The flow record is given in the terms desired on a uniformly graduated chart 11 inches in diameter and the integrating mechanism shows total flow in terms of gallons or cubic feet, on a six-unit cyclometer type counter. If desired, the register can be furnished with indicators of the dial or sector type. The accompanying sketch pictures a typical installation of this type of meter connected to a Venturi type flume.

By means of the recently developed Bailey Synchro-Meter Telemetering System, the same mechanism can be used in the event that the receiving element is to be located at some distance from the measuring weir or flume. In such installations, three conductors are required between transmitting and receiving elements. Alternating current at a frequency of 25, 50 or 60 cycles may be used, and the system is independent of voltage or frequency variations.

For illustrated literature on this new metering instrument and the Bailey Telemetering System write Bailey Meter Company, Cleveland, Ohio.



TYPICAL INSTALLATION OF BAILEY FLOW METER FOR PARSHALL VENTURI FLUME

Improved Pipe Locator

● A novel pipe locator, which operates on a new principle, has been developed by the Water Leak Detector Co. of Columbus, Ohio.

With the new "Universal" locator no electric circuit is required, no wire laying or connections needed. Due to the practice of grounding of household electric-wiring to water pipes, the manufacturers of the new locator found that most pipe systems exhibit sufficient electric induction to make wireless location feasible. However, should this inductance prove insufficient in itself a compact inductor is provided in the steel carrying case supplied with the locator for use in setting up induction currents on mains or service lines sought.

In use, the new type of loop aerial which is designed to secure minimum distortion of field, is capable of picking up the natural or imposed induction currents through exceptional thickness of pavement and earth cover. Added sensitivity is gained through the high-gain amplifier of the set. So simple is the use of the new "Universal" Locator that the most inexperienced employee has been able to use it effectively and

Bailey Meters AT BOULDER DAM

● In Boulder Dam Power Plant as in many other new hydro-electric stations including Madden Dam and Norris Dam, Bailey Fluid Meters are installed on hydraulic turbines.

At Boulder Canyon, the Bailey Meters measure water supply through 13 foot diameter penstocks under an average head of 530 feet. These meters indicate and record the water flow in terms of cubic feet per second and continuously integrate in millions of cubic feet. The registers are operated by pressure connections in the turbine scroll casings.

While your project probably does not entail the volume and head of water that is being measured at Boulder Canyon, it is nevertheless, important that your measurements of flow and liquid level be accurately made by reliable equipment.

Write for complete information on the application of Bailey Meters to your problem. MU-19

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1072 Ivanhoe Road, Cleveland, Ohio
BAILEY METER COMPANY LTD., MONTREAL

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SOLUTION or CRYSTAL?

FOR SLUDGE CONDITIONING—Ferric Chloride is accepted as the agent most efficient from the standpoint of performance and cost.

FOR COAGULATING SEWAGE—Ferric Chloride provides an inexpensive and effective method of dealing with plant overloads.

FOR WATER FILTRATION — Ferric Chloride is an economical and practical coagulant, and gives quick-forming, fast-setting floc. Write

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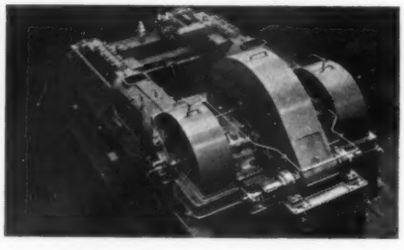
with accuracy. Its chief attribute is freedom from wire connections, ease of handling, dependability and sensitivity, compactness.

The new "Universal" Locator can be procured as a companion piece to the "Universal" Leak Detector, or may be purchased separately. For the new descriptive folder write Water Leak Detector Co., 166 North Third Street, Columbus, Ohio.

Universal Locator

New Automatic Control for Reciprocating Pumps

● For automatic delivery control of reciprocating pumps, a synchronized unloading and loading device has been developed by Worthington Pump and Machinery Corporation of Harrison, New Jersey.



Worthington Automatic Pump Control

The new mechanism is air actuated and suction valve controlled. It assures a quick but gradual decelerating fluid delivery from full flow to zero, and vice versa. In either case the action is the same. The time required for fully unloading or loading any type of reciprocating pump, horizontal or vertical, duplex, triplex or otherwise, does not exceed one-half of one revolution of the pump.

Among several outstanding claims for the new device, one is that it provides positive synchronization of action in loading and unloading, regardless of the point in the pump revolution at which the control functions. The individual cylinders load and unload in sequence on the suction stroke, the action starting with any cylinder, with consequent elimination of shock. In addition, wear and maintenance costs are eliminated regardless of the frequency of loading and unloading the pump. Power losses are minimized when the pump is unloaded, and there is no loss of pressure water in the operation.

A complete description of the operation of the new Worthington control, with an explanation of synchronized unloading and loading, is contained in Bulletin W-445-B1.

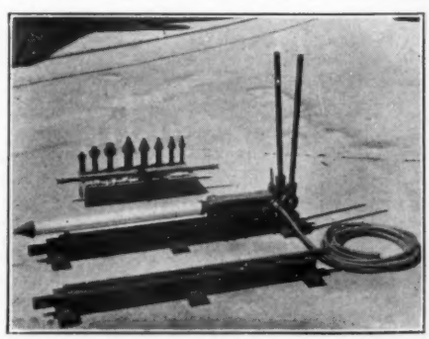
New Pipe Driver

Employs Air Hammer as Aid

● Several new pneumatic tools have recently been introduced by the Inpendent Pneumatic Tool Co. of Chicago.

One new machine is the Thor Pipe Driver. It has been perfected for driving pipes, under roads, streets, sidewalks, embankments, parkways, or any place where it is inconvienent (or costly) to open a ditch or tunnel.

The Thor Pipe Driver is a powerful heavy-duty machine mounted on a geared track and fed by two hand rat-



Thor Pneumatic Pipe Driver

chet handles. An air powered hammer drives the pipe while an operator feeds the machine forward with the ratchet handles. Pipe up to 3-in. diameter is driven easily distances up to 100 feet.

When driving, a pipe-set is inserted in the end of the pipe and fitted to the nozzle of the machine. On the outer end of the pipe a driving-point (see picture) is inserted. The Pipe Driver mounted on a geared track section weighs 305 pounds. The Thor Pipe Driver can be set up and ready for operation in 15 minutes. An interesting feature is the driving point. Being over-sized the driving job is easier and any wrapping or coating on the pipe is not injured by earth squeeze. The Thor Driver (we take it) can be revised for use as a pipe puller also.

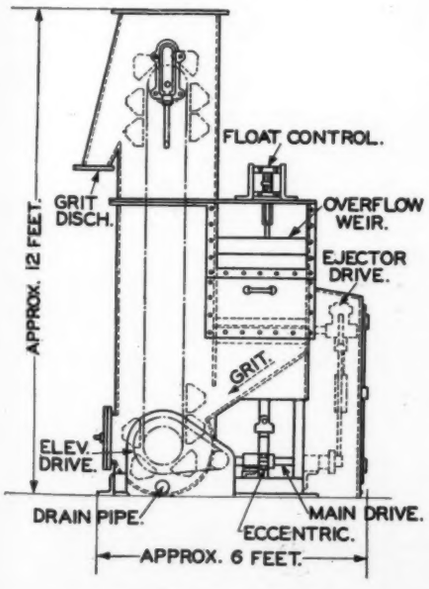
For illustrated folder write Independent Pnuematic Tool Co., 600 W. Jackson Blvd., Chicago.

A New Grit Washer

● A new method of washing grit, involving a new fully automatic jig-type handling and washing unit has recently been announced by The Jeffrey Manufacturing Co. of Columbus, Ohio, following three years of development and testing under plant operating conditions.

This compact unit, requiring but 24 sq, ft. of floor area, will treat up to 6 tons of grit per hour, the washed grit being guaranteed to contain less than 1 per cent of putrescible solids, to be free from objectionable odors or unsightly appearance—In short, *clean*.

Boasting low operating and maintenance costs, the manufacturer states that this new unit requires less than 2 h.p. to operate; and that water consumption is unusually low, the maximum being four pounds of water, (or plant effluent) to one pound of feed at the rated capacity. Organic solids are returned by way of the wash water to the influent sewage. The clean grit from this system is entirely satisfactory for fills, walks or roadways.



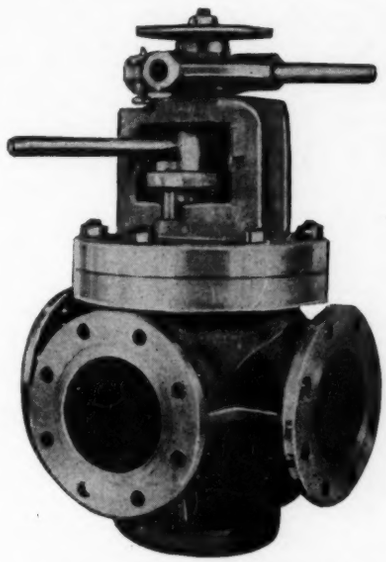
Jeffrey Jig-Type Washer

Engineering data and other facts pertaining to this new "jig type" grit washer may be obtained by writing The Jeffrey Manufacturing Co., Columbus, Ohio.

Easy-Turn Lift Plug Valves

● A new line of brass Easy-Turn Lift-Plug Valves has been announced by the Homestead Valve Mfg. Co. of Coraopolis, Pa.

These valves have been developed for use on air, water, oil and gas services under pressures up to 150 lbs. They



New Homestead Lift-Plug Valve

are available in sizes from 1¼ to 3½ inches. The powerful leverage and screw of the Lift-Plug feature not only assures easy operation, but also permits the plug to be sealed in position at any point at which set.

"Reference Book No. 38," issued recently, describes and illustrates the distinctive features of Homestead Lift-Plug Valves, which come in many patterns, styles and sizes—for manual, hydraulic, or remote operation. For a copy of this catalog write the Homestead Valve Mfg. Co., Coraopolis, Pa.

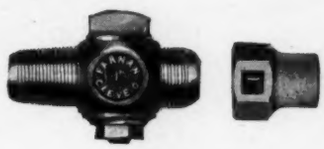
Neon Water Gauge Illuminator

● All who have squinted up at water gauges on boilers will appreciate the Neon Water Gauge Illuminator being offered by The Wright Austin Company of Detroit.

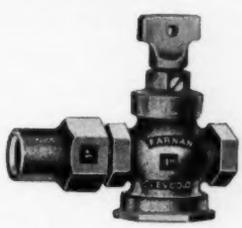
The device represents an application of a thin Neon light tube which is readily attached to the back of any existing water gauge. The whole water column then takes on the red color of the Neon light behind it, making gauge readings at 150 ft. practicable. For further details and price, write Wright Austin Co., 315 W. Woodbridge St., Detroit, Mich.

"FARNAN"

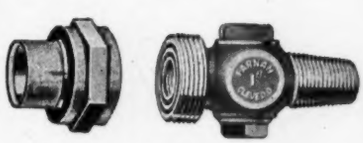
Stops operate easily, are well lapped and have ample seal around ports in plugs to withstand pressure.



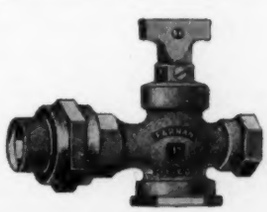
Each article is machined to gauges and tested with two hundred pounds water pressure.



Our complete line consists of corporation and curb stops, couplings and fittings for copper, lead or iron SERVICE PIPE.



We have had 86 years of experience in manufacturing water works brass.



THE FARNAN BRASS WORKS CO.

Established 1852

CLEVELAND OHIO

WITH THE MANUFACTURERS

Col. Rockwell New Vice President W. W. Manufacturers Ass'n

● Colonel Willard F. Rockwell, President, Pittsburgh Equitable Meter Company, has been elected vice - president of the Water Works Manufacturers Association. He was named to the office left vacant by the late Ed. Johnson, former Vice-President of Pittsbugh-Equitable Meter Co. and close associate of the Colonel.

W. F. Rockwell

Western Gas-Bartlett Hayward Consolidation

Koppers Company announces that as another step in its process of corporate simplification, and in order to give more complete service to its customers, its Western Gas Division, Fort Wayne, Ind., has been consolidated with, and will operate as a part of, its Bartlett Hayward Division, Baltimore, Md.

Bachmann Moves to N. Y.

● Frank Bachmann, Manager of the Sanitary Engineering Sales Division of The Dorr Company, Inc., has transferred his headquarters from the Chicago office to the New York office of the company at 570 Lexington Avenue, New York.

Roots-Connersville's New Sales Representatives

● Revisions in territorial representation for turbine pumps, built by Roots-Connersville Blower Corp., Connersville, Ind., have just been announced by J. B. Trotman, manager of the Turbine Pump Division.

R. L. Deppmann Co., 957 Holden Ave., Detroit, are new representatives in the eastern half of Michigan and in the Toledo area. A. G. Bradbury, 2842 W. Grand Blvd., Detroit, continues in charge of sales of other Roots-Connersville products.

Messrs. Lee and Clark, 29 N. Jefferson St., Chicago, have been appointed turbine pump representatives in the greater Chicago area. The company maintains a branch office at 140 S. Dearborn St., Chicago, handling Roots-Connersville blowers, meters, gas and vacuum pumps, etc.

Hiram H. Haight, 2310 W. Vliet St., Milwaukee, has been given the entire state of Wisconsin on Roots-Connersville Water Systems and turbine pumps.

Ryan Sales Corp., 3520 West End Ave., Nashville, are new representatives for central Tennessee.

New Association to Promote Clay Sewer Pipe

● Manufacturers of clay sewer pipe in the states of Ohio, Pennsylvania and Michigan have recently organized an association for the advancement and promotion of vitrified clay sewer pipe. Promotional efforts will be under the direction of Mr. H. C. Maurer of Akron, Ohio, who for many years has been connected with the sewer pipe industry.

The Clay Sewer Pipe Association, Inc., as the new organization will be known, have opened offices in the Oliver Building, Pittsburgh, Pa., and as rapidly as possible other offices will be opened in various cities in the East.

"WHENEVER AIR ACCUMULATIONS Are to Be Automatically Vented SPECIFY SIMPLEX"

●

Write for Bulletin 58.

SIMPLEX VALVE & METER CO.
6743 UPLAND STREET • PHILADELPHIA, PA.

MEETINGS SCHEDULED

Feb. 16—BOSTON, MASS. (Statler Hotel)
New England Water Works Association. (Monthly meeting.) Sec'y, Frank J. Gifford, 613 Statler Bldg., Boston, Mass.

Mar. 9-10—TRENTON, N. J. (Stacy-Trent)
New Jersey Sewage Works Association. (24th Annual Meeting.) Sec'y, John R. Downes, Supt. Sewage Treatment Works, Bound Brook, N. J.

Mar. 13-18—LAWRENCE, KANSAS.
Kansas Water and Sewage Works Association. (13th to 15th Laboratory School; 16th-18th Annual Conference.) Sec'y, Earnest Boyce, State Board of Health, Lawrence, Kansas.

Mar. 16—BOSTON, MASS. (Statler Hotel)
New England Water Works Association. (Monthly Meeting.) Sec'y, Frank J. Gifford, 613 Statler Bld., Boston, Mass.

Mar. 22-24—EAST LANSING, MICHIGAN (Michigan State College)
Michigan Short Course for Plant Operators. Sec'y-Treas., R. J. Faust, Michigan Dept. of Health, Lansing, Mich.

Mar 30-31—ROCHESTER, N. Y. (Sagamore Hotel)
New York Section, A.W.W.A. Sec'y, R. K. Blanchard, 50 West 50th St., New York City.

April .—PHOENIX, ARIZ. (Hotel Adams) (Date not set)
Arizona Sewage and Water Works Association. Sec'y-Treas., P. E. Mauzey, City Hall, Phoenix, Ariz.

Apr. 10-12—MEMPHIS, TENN. (Peabody Hotel)
Kentucky-Tennessee Section, A.W.W.A. Sec'y-Treas., H. D. Schmidt, State Dept. Health, Nashville, Tenn.

Apr. 12-14—TORONTO, ONT. (Royal York Hotel)
Canadian Section A.W.W.A. Sec'y-Treas., A. E. Berry, Ontario Dept. of Health, Parliament Bldgs., Toronto, Ont.

Apr. 14-15—GREAT FALLS, MONT.
Montana Section, A.W.W.A. Sec'y, H. B. Foote, State Board of Health, Helena, Mont.

Apr. 17-19—SPARTANBURG, S. C. (Cleveland Hotel)
Southeastern Section, A.W.W.A. Sec'y-Treas., B. P. Rice, State Board of Health, 422 State Office Bldg., Columbia, S. C.

Apr. 20-22—URBANA, ILL. (Urbana-Lincoln Hotel)
Illinois Section, A.W.W.A. Sec'y, C. W. Klassen, State Dept. of Health, Springfield, Ill.

Apr. 21—SALEM, N. J.
South Jersey Association Water Superintendents. Sec'y-Treas., Walter Spencer, Merchantville, N. J.

Apr. 25-26—INDIANAPOLIS, IND. (Antlers Hotel)
Indiana Section, A.W.W.A. Sec'y-Treas., J. A. Bruhn, Indianapolis Water Company, 113 Monument Circle, Indianapolis, Ind.

Apr. 27-28—DAYTON, OHIO (Van Cleve Hotel)
Ohio Section A.W.W.A. Sec'y-Treas., T. R. Lathrop, State Dept. of Health, Columbus, Ohio.

May 3-6—COLUMBIA, S. C. (University of South Carolina)
South Carolina Short School. Sec'y, B. P. Rice, State Sew. Engr., 422 State Office Bldg., Columbia, S. C.

May 4-5—CUMBERLAND, MD. (Fort Cumberland Hotel)
Maryland-Delaware Water & Sewerage Association. Sec'y-Treas., A. W. Blohm, State Dept. of Health, 2411 N. Charles St., Baltimore, Md.

May 11-13—TACOMA, WASH. (Hotel Winthrop) (Tentative)
Pacific Northwest Section, A.W.W.A. Sec'y-Treas., Fred Merryfield, Assoc. Prof. San. Eng., Oregon State College, Corvallis, Oregon.

June 11-15—ATLANTIC CITY, N. J. (Hotels Ambassador and Chelsea—Registration, Meetings, Exhibits in Auditorium)
American Water Works Association. (59th Annual Convention.) Sec'y, Harry E. Jordan, 22 East 40th St., New York City.

(*Continued on Page* 68)

OVER 5,000 H.P. of gas engine driven BLOWERS installed in activated sludge plants

The cost of furnishing air—often the biggest item of operating expense for activated sewage disposal plants—is being reduced by using gas engines direct connected to Roots-Connersville positive displacement blowers.

Using this energy in sludge gas for delivering the air required—direct through gas engine driven blowers—accomplishes about 25% more useful work than when this energy is converted into electrical power, then back again, through motors, into air delivery or other useful work.

Roots-Connersville blowers range in size from 5 H.P. to 1,000 H.P. units. They provide the most economical air supply available in many sewage plants throughout the country. The two 4,000 C.F.M. gas engine driven "R-C" blowers shown here supply air at 8½ lbs. pressure at Topeka, Kansas.

Roots CONNERSVILLE

BLOWER CORPORATION, 902 Mount Ave., Connersville, Ind.

June 26-28—STATE COLLEGE, PA. (Nittany Lion Inn and Dormitories.)

Pennsylvania Sewage Works Ass'n. Sec'y-Treas., L. D. Matter, Distr. Eng'r., Kirby Health Center, Wilkes-Barre, Pa.

June 28-30—STATE COLLEGE, PA. (Nittany Lion Inn and **Pennsylvania Water Works Operators' Association.** Sec'y-Treas., I. M. Glace, 22 South 22nd St., Harrisburg, Pa. Dormitories)

Catalogs and Literature

"Infilco HYDRODARCO Purifiers" are featured in a new bulletin from International Filter Company of Chicago, wherein some "everyday" and some unusual installations are pictured. A helpful paragraph differentiates between *ad*sorption and *ab*sorption, the two phenomena which prove confusing to many. The granular carbon of the "Hydrodarco" Purifier removes foreign matter from waters only by *ad*sorption on the *"skin"* of the granules, as contrasted to *ab*sorption exhibited by sponges and blotting paper. On the other hand residual chlorine is removed by a two stage action, in which adsorption is followed by chemical catalysis, productive of nascent oxygen and continuous reactivation of the carbon. In consequence, super-chlorination, ahead of "Hydrodarco" purifiers is recommended as an ideal practice. The chlorine plays the dual role of destroyer of organic bodies and as reactivator, its complete removal, involving nascent oxygen production, being automatic regardless of the degree of overdosage with chlorine. "Infilco" Purifiers are enamel lined to preclude corrosive galvanic action between the steel shell and the carbon. For a copy of this interesting and enlightening Bulletin 1700, write "Infilco"—59 East Van Buren St., Chicago.

"Foster Pressure Reducing Regulators"—From Foster Engineering Co., Newark, N. J. (Established 1879) comes a catalog presenting the Foster U-Type Pressure Reducing and Regulator Valves for air, water, gas. The new catalog contains a description of each of the five models, designed to cover a wide range of services. The operation of the unique U-Type Regulator is described and picturized in detail, with the aid of dimensional line drawings, cut away views and typical installations. Sizes cover a range of ½ to 20 inches, serving as pressure reducing and altitude valves (remote control optional) in water works systems. Dismantling, parts replacement, and assembly instructions are given. To all interested in pressure control (air, gas or water systems) should request Catalog 70—Bulletin 5. Address, Foster Engineering Co., 109 Monroe St., Newark, N. J.

"Safe Sanitation for a Nation"—Tells something of the history behind Pacific Flush Tank Company and the part it has played in sewerage developments of the nation since 1891, when Sidney W. Miller established his flush-tank business in Pasadena, Calif. In 1893, however, P.F.T. moved to Chicago and has been manufacturing sewerage equipment solely these 48 years. Beginning with the production of the simple sewer flush-syphon the subsequent achievements and type of service rendered is recounted. P.F.T. believes that their most profitable business (ultimately) has been that "busi-

The LOCK JOINT "Book of Experience"

Installing Pipe for the City of Little Rock, Arkansas

10,000 Flawless Expansion Joints

ON THE 32-mile pipe line of 39" diameter Lock Joint Reinforced Concrete Pressure Pipe recently completed for the City of Little Rock, Arkansas, *not one* of the more than 10,000 joints showed any signs of leakage during the tests for final acceptance of the line.

In fact, the results of these tests showed the measured leakage to be less than ten per cent of that permitted under the specifications, proving again the superior watertightness of Lock Joint Pipe Lines.

LOCK JOINT
Reinforced Concrete
PRESSURE PIPE

LOCK JOINT PIPE CO. Est. 1905. Ampere, N. J.
Pressure : Sewer : Culvert : Subaqueous

ness" of staying with P.F.T. installations beyond the specified "guarantee period." Much of the brochure is devoted to typical and outstanding installations of P.F.T. equipment. Most conspicuous are the Downes' Floating Covers for sludge digesters and P.F.T. Rotary Filter Distributors,—of which 230 units are in service —the largest being the 173 ft. Atlanta units. P.F.T.'s address is 4241 Ravenswood Ave., Chicago, Ill.

"Lo-Maintenance Motors"—Are covered in a new illustrated bulletin from the Allis-Chalmers Mfg. Company of Milwaukee. Captioned "Save On Service Costs With Allis-Chalmers 'Lo-Maintenance' Motors," several pages of this eight page bulletin are devoted to case studies of "Lo-Maintenance" motors that have been in operation under the most adverse conditions. Also included are illustrated descriptions of construction details of these squirrel cage (induction type) motors, and a table giving their applications. For a copy of bulletin 1193 write Allis Chalmers, Milwaukee, Wisc.

"Lightnin Mixers" — In the chemical industry "Lightnin" mix is synonymous with "flash-mixing" in the water, sewage and trade-waste fields. A new bulletin from Mixing Equipment Company, Rochester, N. Y., pictures and gives specifications covering the many models of the gear-drive and direct drive types of these motor driven impeller type portable "Lightnin" Mixers, many of which are already in use in modern water and sewage treatment plants. Standard on these mixers is the stainless steel shaft and blades, but for highly corrosive conditions rubber or lead covered shaft and blades are supplied. Being adjustable, these portable units can be set at the most efficient angle and location determined best by trial—a real asset. For a copy of the new "Lightnin" bulletin, write Mixing Equipment Company, 1087 Garson Ave., Rochester, N. Y.

"Portable Gasoline Generators"—Are the subject of a special bulletin from Homelite Corporation, Port Chester, New York. In it are described the complete line of Homelite miniature portable gasoline engine driven electric generator units. Three new types have just been added to the line. Generators delivering 650 to 3000 watts (DC) or 500 to 2500 watts alternating current are available, all being 110 volt units. These generators have a multiplicity of uses, as illustrated, the most valuable to water works men being for night emergency work. Both generator and the flood lamp actually fit into the luggage compartment of an automobile. These units are also used to operate any sort of power driven tools, gate-valve operating equipment, charging storage batteries, or emergency lighting of plants. The portable generator (94) lbs.), like the portable "Homelite" pump and blower units, has come to be a popular utility tool. For the new bulletin write Homelite Corporation, Port Chester, N. Y.

"Sewer Cleaning Equipment" of the Expanding Sewer Cleaning Equipment Company, Nappanee, Ind., is presented in a catalog just received. Featured are the Nappanee Expanding Root Cutters, adjustable to fit sewers from 8 in. to 30 in. diameters, a feature of which are the five sets of double cutting blades of spring-steel. The Nappanee line includes "Sure Grip" rods and attachments, hand windlasses, power windlass (by O.K. Champion), steel sewer rods (by Coleman), and hydraulic flushers. At the end are several pages of testimonials, plus an impressive list of users, and a price list. For a copy of Catalog 38 write Expanding Sewer Machine Co., Nappanee, Ind.

The Venturi Meter—Bulletin 293.
Measurement, Control, and Chemical Treatment of Sewage and Sludge—Bulletin 287.
Venturi Rate of Flow Controllers—Bulletin 281.
Venturi Direct Acting Filter Controller — Bulletin 297.
The Long Distance Chronoflo for Water and Sewerage Systems—Bulletin 298.

For copies of any of these bulletins, or for engineering recommendations regarding the application of Metering and Controlling Equipment, address,

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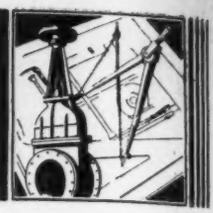
WATER WORKS & SEWERAGE



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FOR JOINTING CAST-IRON WATER MAINS
Melted and Poured — *No Large Bell-holes to Dig*
Saves at Least 75%
Leadite is shipped in powder form, packed in sacks of 100 lbs. net each
Leadite tested and used for over 35 years • Leadite joints improve with age
Be sure it is Leadite and accept no imitations
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Girard Trust Co. Bldg., Philadelphia, Pa.
No Caulking

METER BOX COVERS
Ford meter box covers for water meter settings are made in single and double lid types and in many sizes. Write for complete catalog describing covers and other equipment for water meters.
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WABASH, INDIANA, U. S. A.
SETTING AND TESTING EQUIPMENT FOR WATER METERS

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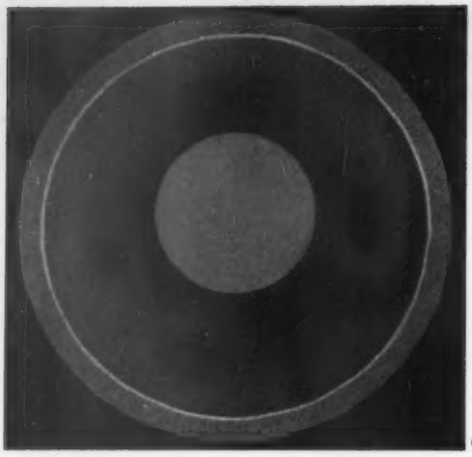

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— May, 1939 —

The Annual Convention and Reference Data Edition of Water Works and Sewerage.

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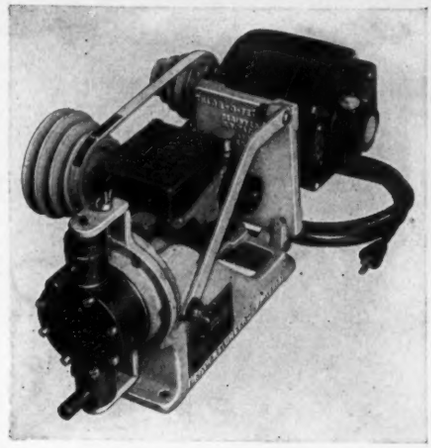

Motor driven Midget Chlor-O-Feeder

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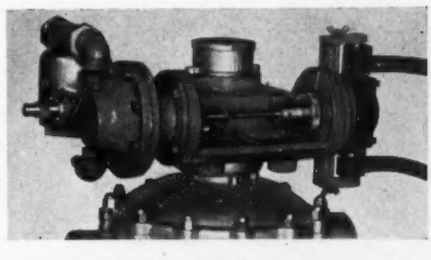

Proportional Chlor-O-Feeder, meter mounted.

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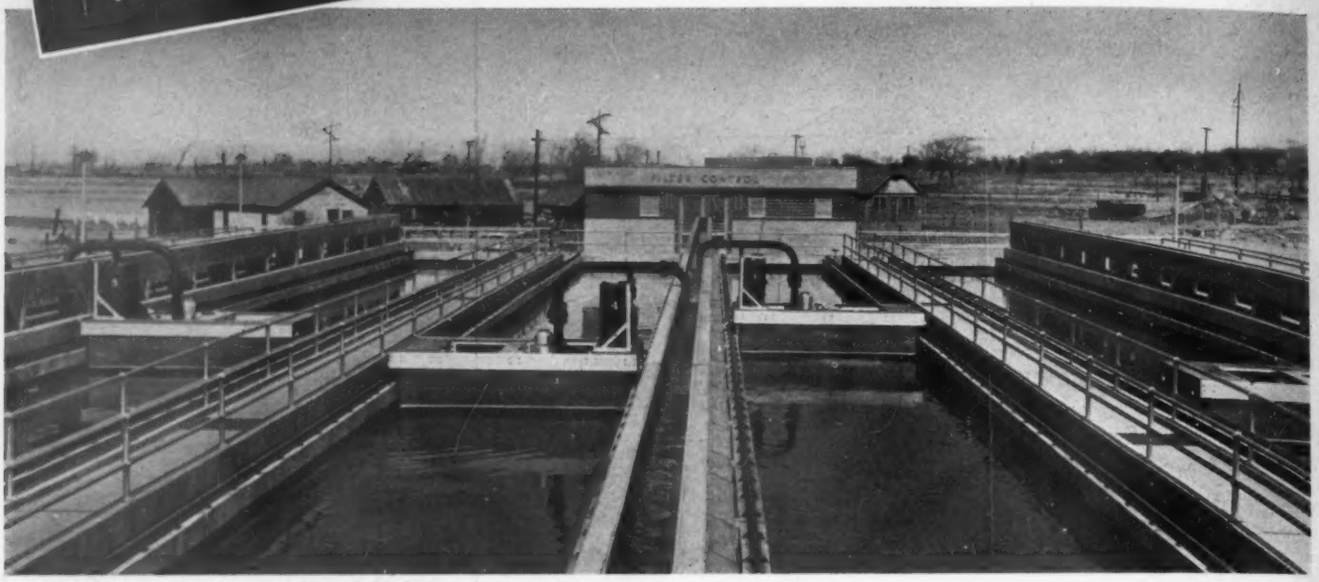
BETTER PRIMARY TREATMENT

POLISHING PRIMARY EFFLUENTS *at Denver*



6 Automatic Magnetite Filters, each 12 ft. wide x 200 ft. long, handling 38 M.G.D., at Denver, Colo.
Consulting Engineer: Black & Veatch, Kansas City, Mo.

with AUTOMATIC MAGNETITE FILTERS

DENVER DATA

Averaged composited samples—Aug.-Dec., 1938. Flow 37.8 M.G.D.

Suspended Solid Contents—P.P.M.

Raw 170 Settled 57 Filtered 34

Suspended Solid Removals

By Settling 66% By settling plus Filtration 80%

B. O. D.'s P.P.M.

Raw 150 Settled 86 Filtered 61

B.O.D. Reductions

By Settling 43% By Settling plus Filtration 59%

ADVANTAGES FOR PRIMARY TREATMENT

- Chemical precipitation results without the cost of chemicals.
- Improved effluents from primary settling tanks.
- Postponement of secondary treatment for a period of years.
- More capacity from existing sedimentation units and trickling filters.
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59% REMOVAL B.O.D.

At Denver, Colo., a battery of Automatic Magnetite Filters is improving the quality and uniformity of primary clarifier effluent by reducing suspended solids from 57 PPM to 34 (80 per cent.), cutting the B.O.D. from 86 PPM to 61 (59 per cent.).

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Yet, the annual interest and amortization on the filter installation is only a small fraction of what the yearly chemical cost would have been for equivalent removals.

If you are interested in how to make a primary treatment plant do a bigger or better job, check through the Denver operating data at the left and the advantages of the Automatic Magnetite Filter as a primary treatment booster.

Write now for a copy of our bulletin on the Automatic Magnetite Filter.

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This advertisement on *Primary Treatment* is the first of a series on the various applications of Automatic Magnetite Filters.

Others of the series, now in preparation, will deal with

Chemical Precipitation
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Improving Existing Plants

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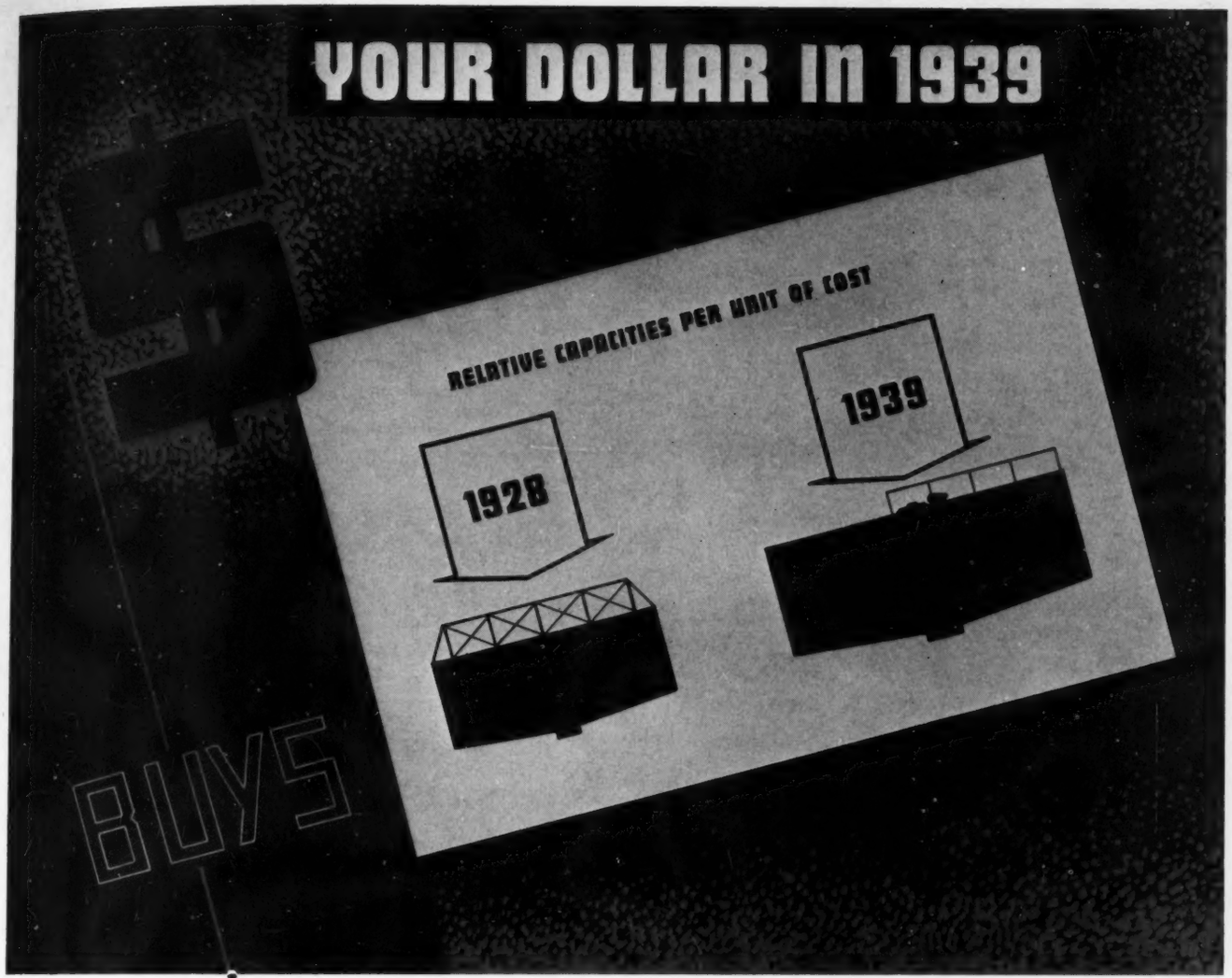

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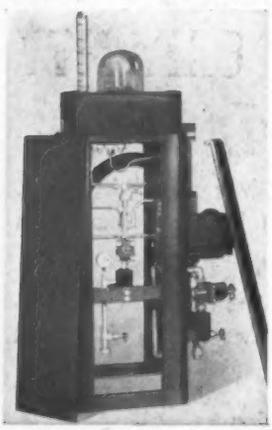

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